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July 1929

Electrical Manufacturing

1687
3995

Vol. 4 A Gage Publication No. 1

Assured

Safety

in cell structures

The pictures show an installation at a large steel plant which is typical of many found in the Public Utility and Industrial Fields.

Ambler also manufactures an Ebonized Asbestos Lumber offering equal safety for switchboard work.

AMBLER ASBESTOS LUMBER

..... *Fireproof*	Asbestos cannot burn. Danger from short circuits completely eliminated. It is approved by the Underwriters' Laboratories.
.. *Structural Strength*	Not only possessing exceptional strength, but more than strong enough for any cell or barrier construction.
..... *Workability*	Ambler Asbestos Lumber is cut and drilled to dimensions at the factory according to specifications, thereby requiring little working at the point of installation.

AMBLER ASBESTOS SHINGLE & SHEATHING CO.

Ambler, Pa.

TK1
.E362

"Belden Unbreakable Soft Rubber Plugs Cost Less in the Long Run"

THESE are the very words of a large manufacturer of electrical refrigeration equipment.

Here is more of his statement: "We found the cost of replacing broken plugs so great that we standardized on Belden Soft Rubber Plugs. As a result, the numerous service calls we used to have, due to broken plugs, have been completely eliminated, and by standardizing on Belden Soft Rubber Plugs we actually lowered our costs.

"Since the average service call costs in the neighborhood of two dollars, it is not surprising that the Belden Soft Rubber Plug is actually saving us money.

"Incidentally, we have found that the Belden Soft Rubber Plug is also an aid in making sales. Dealers and customers appreciate the elimination of broken plugs."

Belden Soft Rubber Plugs are provided with the Belden Cut Cord Service on all rubber cords and textile insulated cords as well.

It will pay you to investigate the cost reducing and sales building features of Belden Soft Rubber Plugs, "The Plug Unbreakable for Things Electrical."

Write today for the complete story!

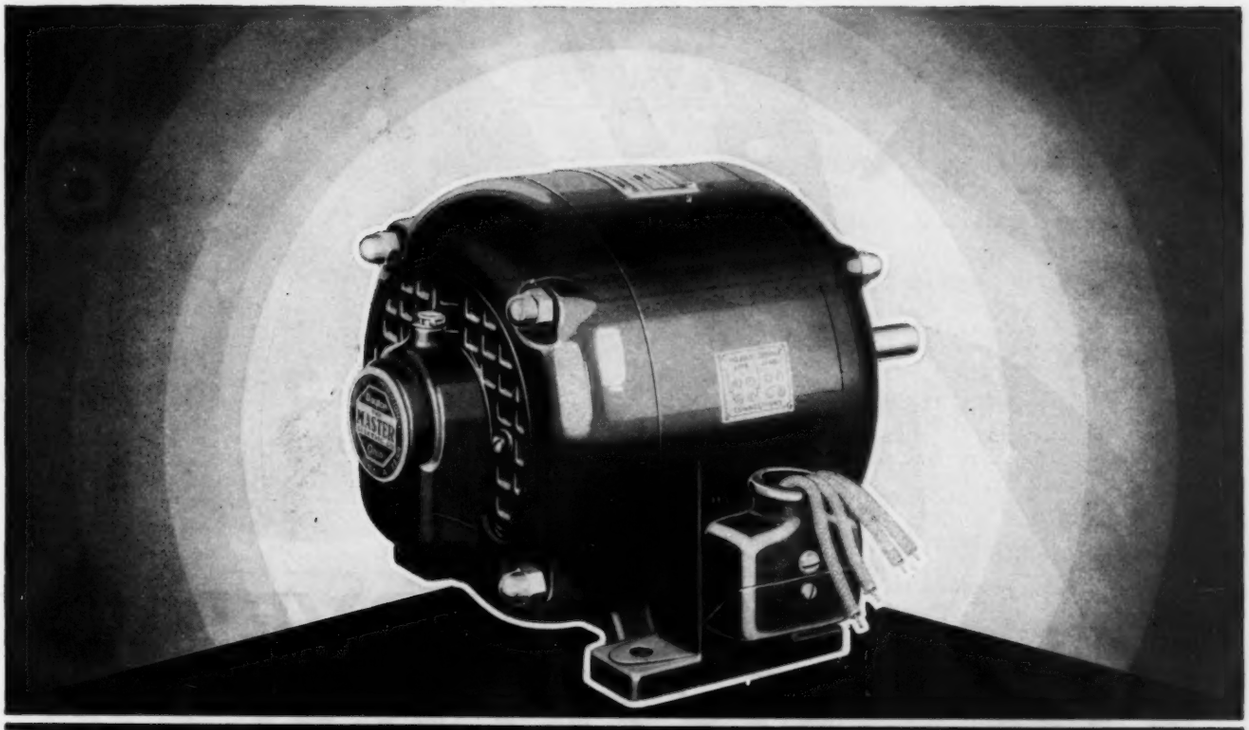
Belden Manufacturing Company

2310-B South Western Ave. **Chicago, Ill.**

BELDEN PRODUCTS

Beldenamel and Textile Magnet Wire
Coil Windings
Beldenmold (Molded Bakelite Products)
Automotive Wires and Cables
Airplane Assemblies
Radio Wires, Cords and Cables
Rubber Covered Wires
Armored Cables
Flexible Armature Wires
Motor Lead Wires
Braided and Stranded Copper Cables
Cotton Sleeving

Specify Belden



"It's a MASTER"

Little Stories of MASTER MOTORS

OUR customer's shop was "tooled up" and production nicely under way on the new product. The tired Superintendent leaned back in his chair with a sigh of relief. Tomorrow was a holiday and he was glad for a chance to rest.

"R-r-i-ing! He reached almost irritably for the telephone that disturbed his thoughts. It was the Assembly Foreman on the line. "Brocton, the motor we specified on that new type A. L. won't give us clearance. We've got to have a "special."

"I'll get in touch with Master right away, George, and see what they can do for us." Brocton replaced the receiver wearily. The day before a holiday—all set to go—rush orders waiting—wrong specifications on the motor. If his secretary overheard strange mutterings, she tactfully overlooked them.

Within an hour The Master Electric Company had a telegram telling of the difficulty. All night and during the holiday our Engineering Department and our Pattern Shop worked on the new pattern necessary to change the motor over to fit the requirements. The next day the foundry cast them. The day after they went through our machine shop. We rushed them out to our customer. Everything was O. K.

Holidays mean nothing to the Master Organization when a customer gets in a jam. But, just the same, a letter like this is appreciated:

Master Electric Co.,
Dayton, Ohio.

Gentlemen :—

It is with no little pleasure that we acknowledge your much appreciated letter. We, like you, appreciate receiving the treatment we like to accord the other fellow and it is our hope that we can continue to turn considerable business your way.

You have given us good service, good quality and splendid treatment. We can't ask any more.

Sincerely yours,

The orignal of this letter is in our files and you may have the name and address of the customer, should you wish to refer to them.

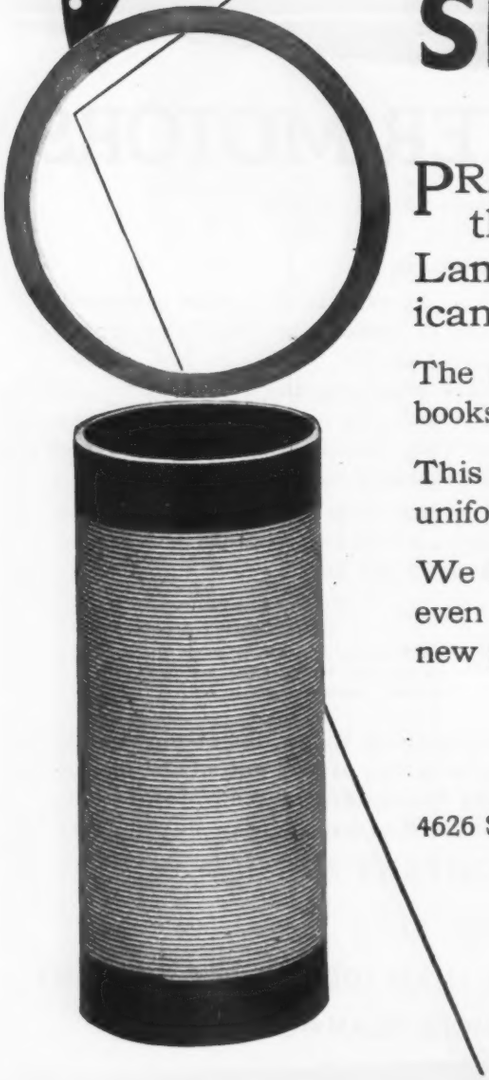
Willingness to go out of our way to be of service is just one of the reasons why Master Guaranteed Motors have increased so tremendously in popularity.

THE MASTER ELECTRIC COMPANY
Dayton, Ohio.
Manufacturers of Master Guaranteed Motors

STOCKS CARRIED IN PRINCIPAL CITIES — MORE THAN 100 SERVICE STATIONS
1/20 TO 10 H.P. — NOT MORE THAN 40°

Dayton THE MASTER ELECTRIC CO. Ohio

WE HAVE SERVED *for* SIXTEEN YEARS



PRACTICALLY since the beginning of the industry Formica has been making Laminated Phenolic materials for American electrical organizations.

The names of many of the leaders have been on our books almost from the beginning.

This continued confidence can only be due to good and uniform materials promptly made and delivered.

We have steadily added to plant and equipment - - - even now a new factory building which will house new producing tools is under construction.

THE FORMICA INSULATION CO.
4626 Spring Grove Ave. Cincinnati, Ohio

FORMICA

Electrical Manufacturing

Reg. U. S. Patent Office

Volume 4 | JULY, 1929 | Number 1

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Irwin Robinson, *News Editor* — Edward H. Dutcher, *Production Editor*

Electrical Manufacturing's editorial program has the following objectives:

Production

To help all electrical manufacturers, including makers of motor-driven products, increase the product's salability, cut unit production costs, quicken turnover, reduce overhead expenses, establish standard methods of work, and spread a better knowledge of raw materials and parts.

Marketing

To spread a better knowledge of and aid electrical manufacturers in adjusting sales management to the buyers' market, to aid in making advertising more effective, finding the most profitable distribution channels, and promoting cooperative market development.

Administration

To further the working out of sounder management policies and better executive control, coordinating sales and production schedules, promoting research, and developing better industry relations.

Repairing

To help all motor repair shops to build better business by developing a sounder organization, improving management, policies and methods, and developing a keener merchandising point-of-view on the business.

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BOHNALITE

62%

Lighter than Iron

Maintaining the same degree of strength and efficiency in the product, and at the same time making it as light as possible, is a production problem that has been solved by many manufacturers by the use of Bohnalite.

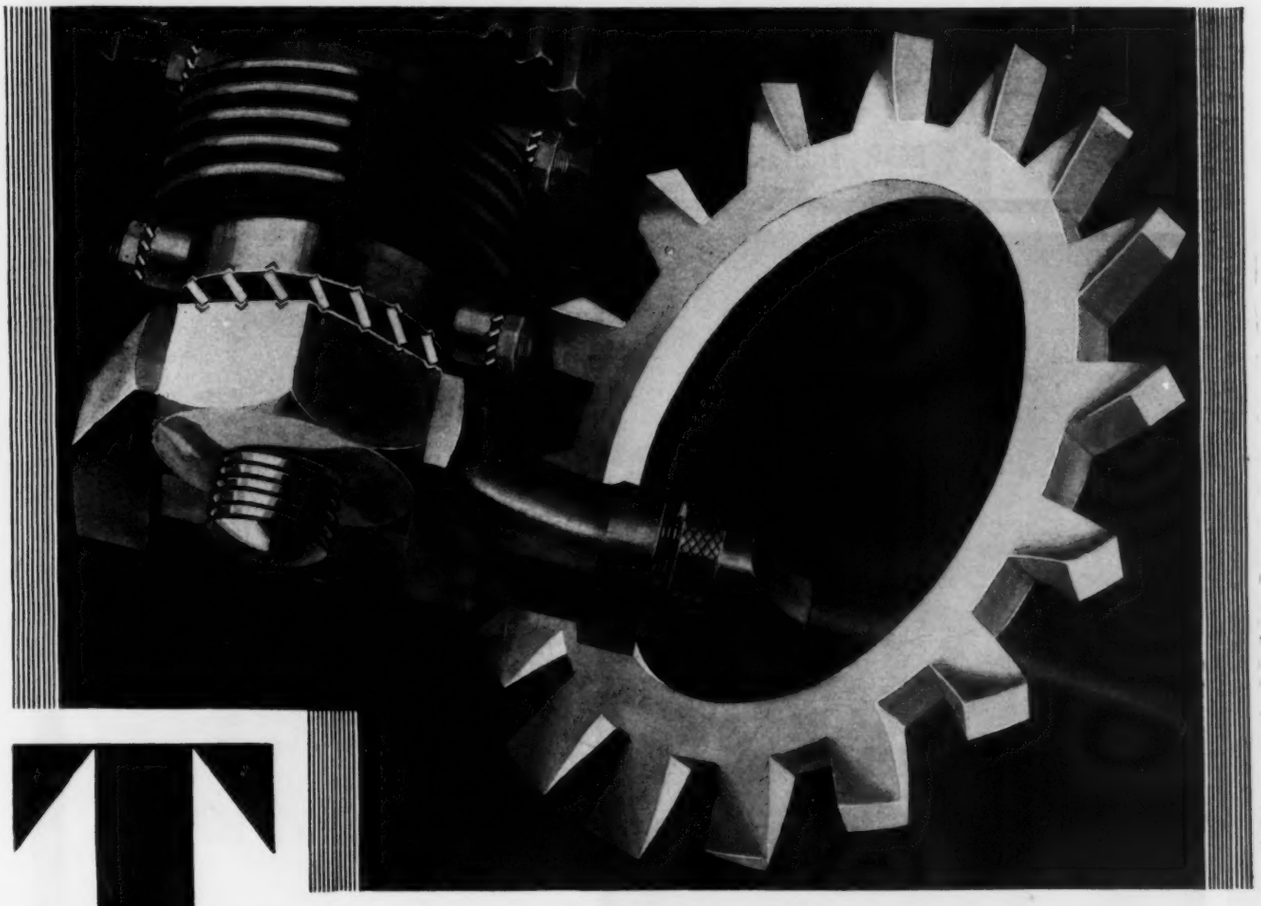
For Bohnalite is an alloy 62% lighter than iron, possessing every advantage of iron with none of its disadvantages and having in addition many valuable features of its own.

It has high uniform hardness—great density—fine grained structure—exceptional strength—excellent bearing qualities—ductility and lightness.

Let us demonstrate and prove to your engineers that it will take the place of iron in your product with a real increase in all-around efficiency.

Send us your blue prints and ask for the latest Bohnalite Booklet.

BOHN ALUMINUM & BRASS CORP., DETROIT, MICH.
New York Chicago Philadelphia Cleveland Pittsburgh

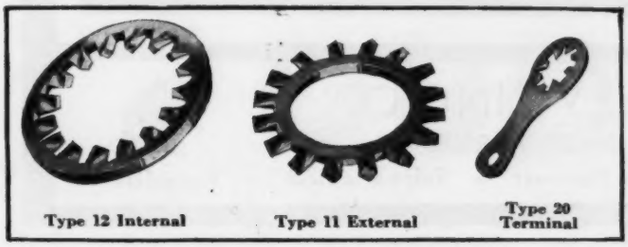


Twisted steel teeth biting into the nut...

SHAKEPROOF LOCK WASHERS are designed to hold nuts securely regardless of strain or vibration. Around the circumference of the washer are teeth of hardened steel, twisted. When a nut is turned down, each tooth bites in with a grip of steel. Only applied force can loosen their tenacious hold.

This unique design of SHAKEPROOF Lock Washers also prevents linking and speeds up production.

Over 150 different types of industries are finding new savings in SHAKEPROOF Lock Washers. Somewhere on your product there is a place for SHAKEPROOF. Mail the coupon below for samples and test this modern lock washer out.



Type 12 Internal | Type 11 External | Type 20 Terminal

SHAKEPROOF
Lock Washer Company
{ Division of Illinois Tool Works }
2513 North Keeler Avenue Chicago, Illinois

U.S. PATENTS 1,419,384; 1,604,122; 1,697,954. OTHER PATENTS PENDING. FOREIGN PATENTS

FREE SHOP TEST SAMPLES

SHAKEPROOF LOCK WASHER CO.
2513 North Keeler Ave., Chicago, Ill.

Please send me samples of

☐ Shakeproof Lock Washers to fit bolt size_____

☐ Shakeproof Locking Terminals, size_____

Firm Name_____

Address_____

Town_____ State_____

By_____

HORSE HEAD ZINC

FOR THE DIE CASTING INDUSTRY

"Hooking-up" Utility

This condenser frame . . . this utilitarian body . . . is a die-casting which frames the whole of a radio. Strong . . . rugged . . . and splendidly designed (notice the thin wall sections, the cored holes, the general appearance).

This (and 500,000 exactly like it) are made of a Horse Head Zinc base die casting.

with Beauty

This loud speaker frame . . . this graceful body . . . this amplifier of beauty is also die cast of a Horse Head Zinc base alloy.

Die castings can be strong—utilitarian. Die castings can be graceful—beautiful.

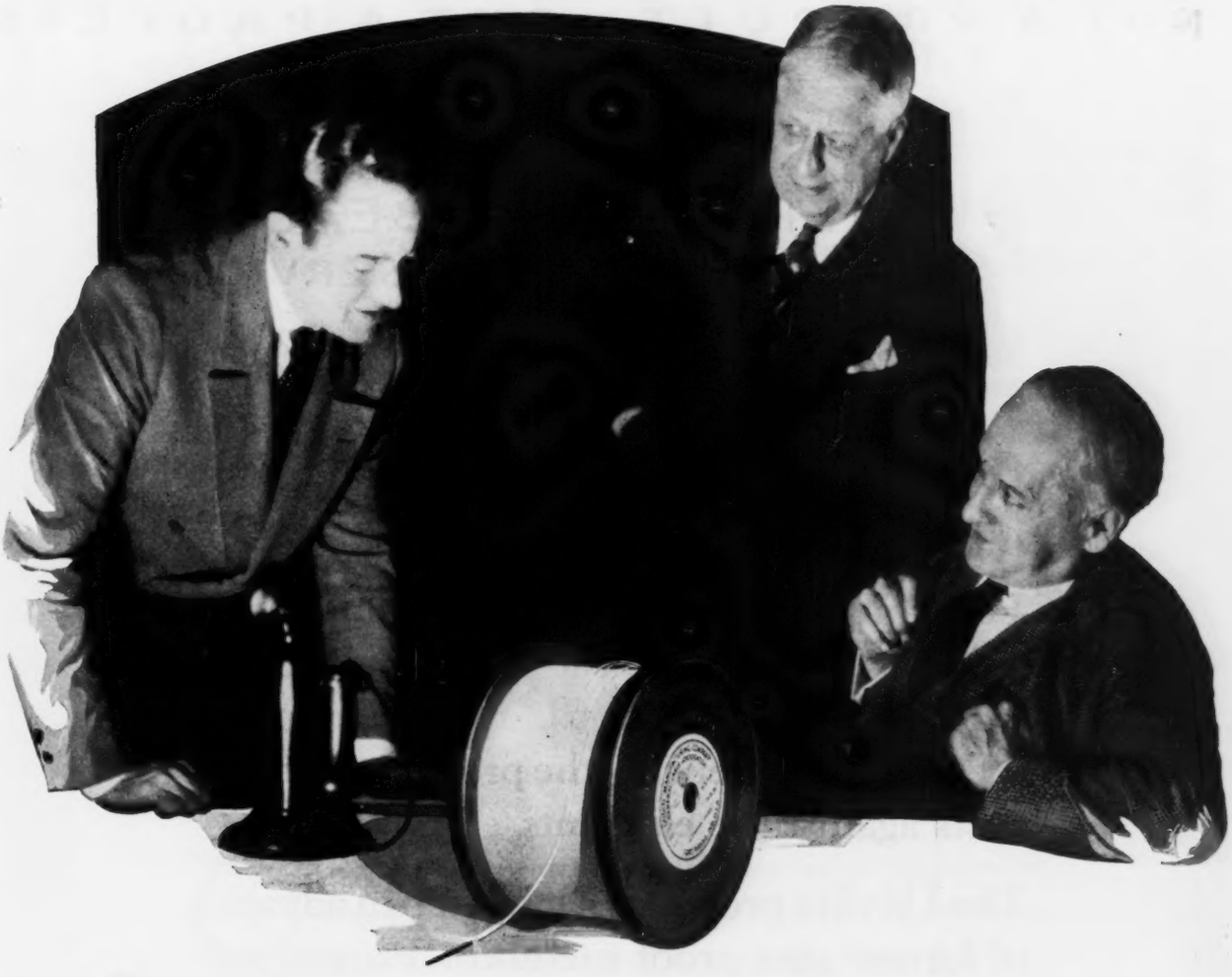
And Horse Head (*uniform quality*) Zinc serves equally well for either, and also for a combination of both. Strength is inherent, and beauty of design easily applied to this metal.

New Jersey zinc

THE NEW JERSEY ZINC CO.

160 FRONT STREET, NEW YORK CITY

Zinc Metals and Alloys - Rolled Zinc - Zinc Pigments - Sulphuric Acid - Spiegeleisen



Insulation··*that stands the gaff*

"Here's the only wire that held up on every test we put it to," said the engineer of one of the country's largest motor manufacturers.

"How about dielectric strength?" said the superintendent, who had had armature troubles when motors were overloaded.

"Stood a twist test of 2000 volts without breaking down," said the engineer.

"That's fine, but how does it stand elongation?"

"O. K.," the engineer replied, "even this No. 14 stood 25% without a sign of enamel failure."

"Yes, and we mustn't forget that Dudlo has always been willing and able to help us out on the tough jobs whenever we were up against it," added the purchasing agent.

DUDLO

Dudlo wire will always prove itself in your laboratory as well as in the manufacturing processes.

DUDLO MANUFACTURING COMPANY, FORT WAYNE, INDIANA
Division of General Cable Corporation

NOT A PRODUCT . . BUT A PROCESS

PERMANENT BEAUTY
WITH YEARS OF SERVICE

Wherever Udylite is used there is positive insurance against rust and corrosion—enemies that cause millions in losses to American industry.

Permanent beauty—a satin-like finish that adds to the sales appeal of any article, is a prominent attribute of Udylite, but of far greater consequence is the protection of vital parts against the elements.

The Udylite process is a long step in advance of former rust proof methods. Proven successful through hundreds of installations, it is enabling manufacturers to maintain the high quality of their products over the years. From the standpoints of economy and good business, Udylite occupies a distinctive place.

Write us for full details on your rust proofing problems.

Udylite
RUST PROOFS
REG. U S PAT OFF

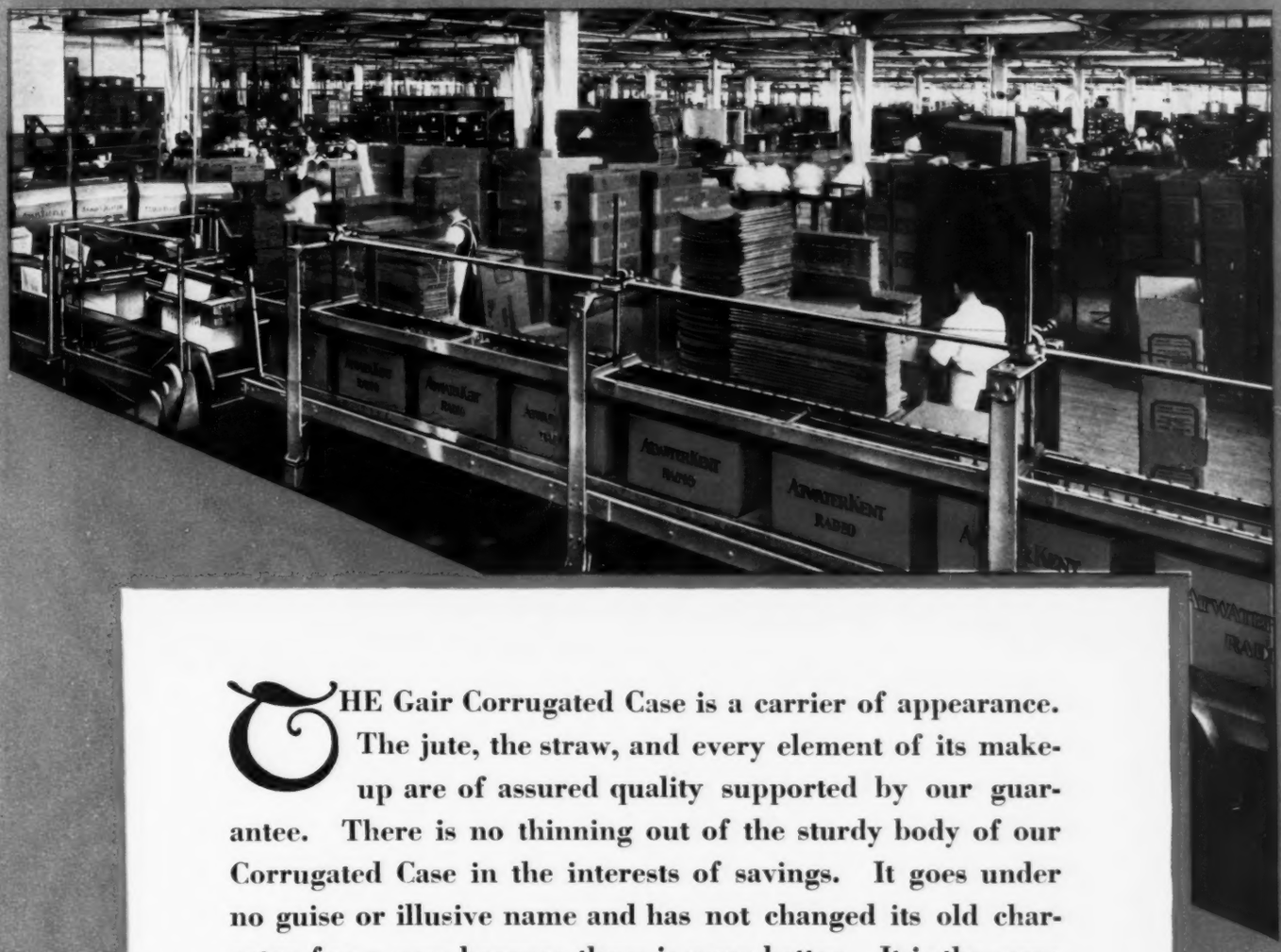
The UDYLITE PROCESS COMPANY

Eastern Sales Office:
30 East 42nd St., New York

3220 Bellevue Avenue
DETROIT, MICH.

Western Sales Office:
114 Sansome St., San Francisco, Cal

GAIR CORRUGATED SHIPPING CASES



THE Gair Corrugated Case is a carrier of appearance. The jute, the straw, and every element of its make-up are of assured quality supported by our guarantee. There is no thinning out of the sturdy body of our Corrugated Case in the interests of savings. It goes under no guise or illusive name and has not changed its old character for a new because there is none better. It is the same tan-brown jute that has given the Gair Corrugated Case its prestige for looks and durability. Our jute liner is the carefully formulated product of our own mills.

Color printing, with sunshine in it, on rugged boxes that resists the freight handlers' practical knocking about still leave a loop-hole for disappointment if the Corrugated Cases do not move in smooth procession over the sealing machine, well squared and with flaps meeting, emerging perfectly finished. Our engineers are familiar with every existing sealing machine, and the adaptability of our Cases to their varying requirements is their first consideration.

ROBERT GAIR COMPANY

420 LEXINGTON AVENUE,~NEW YORK,~N.Y.

GAIR CORRUGATED SHIPPING CASES

WE LIKE to serve the strong, particular and technically informed buyer of Corrugated Cases. His criticisms, suggestions and repeat orders are all evidence of an intimate confidence. He has Corrugated Case ideas of his own—we respect them and study them, and nine times out of ten bring in our Creative and Design Department to put ultimate safety and economy into his Shipping Case if there is a chance for doing so.

There is a distinguishing quality about the material and the build of Gair Corrugated Cases. Matter of course details, such as the number of arches to the lineal foot, the weight per thousand square feet and the pressure test are controlled by regulation—every honest Corrugated Case that has not undergone the devitalizing operation of quality clipping in the interest of cost saving should conform with these regulations, as Gair Corrugated Cases do.

There is something typical about the Gair Corrugated Case. This is due to the day-in and day-out, continuous manufacture of the standardized jute liner and tough oat straw that goes into it. Also, to the unequalled advantage that the three Gair Corrugated Case Plants have of calling upon the skill of the artists associated with the fine multi-color printing departments when featuring display advertisements on Gair Corrugated Cases.

ROBERT GAIR COMPANY

420 LEXINGTON AVENUE,~NEW YORK,~N.Y.

THE WORLD FIGHTS FRICTION

The first appearance of machines in the history of mankind was, curiously enough, accompanied by another eventful idea. The machines were designed to reduce manual labor, and also to enlarge output without increasing the original expenditure of energy. The rudimentary drill of primitive Europe is an example. Rotation of the end of the drill was made easier by supplying the end with a hard point cut from deer antler. The bearing in which this turned also was made of antler horn so that friction, and consequently the driving effort, was considerably reduced. So the world began the battle to eliminate friction, which today is so successfully accomplished by ball bearings.

Select TORRINGTON BALL BEARINGS for those important points in your production where friction develops. These ball bearings possess qualities which distinctly add to the life and efficiency of machines.

TORRINGTON BALL BEARINGS represent the highest development of precision manufacture. They operate smoothly, and with a minimum of friction, under severe conditions of load and speed.

The Torrington Company
ESTABLISHED 1866
Torrington, Conn., U.S.A.

DISTRICT SALES REPRESENTATIVES

S. W. Anderson
565 W. Washington Blvd.
Chicago, Ill.

Gibson & Hodgson
2315 Dime Bank Bldg.
Detroit, Mich.

AIR Congestion

The C-O Blower No. 8-D shown above is a variable speed electric blower, having a DUMORE Motor of special type, developed exclusively for this service. It is equipped with a dust-proof case and is not effected by temperature change.

Thousands of Dumores in this Service

KEEPING air circulating . . . moving soot and dust out of its "lodging places" . . . is the assignment rightfully given to the blower. It provides the draft and pressure to relieve air congestion . . . and does so efficiently because it is *powered* by a fractional horse-power electric motor.

The Canedy-Otto Manufacturing Co. of Chicago Heights, Ill., manufacture a line of blowers and use the Dumore Universal type motor. They tell us that they have several thousands of their blowers with Dumore Motors in service, and that they have had practically no trouble.

This is but one of hundreds of fields which Dumore Motors serve satisfactorily.

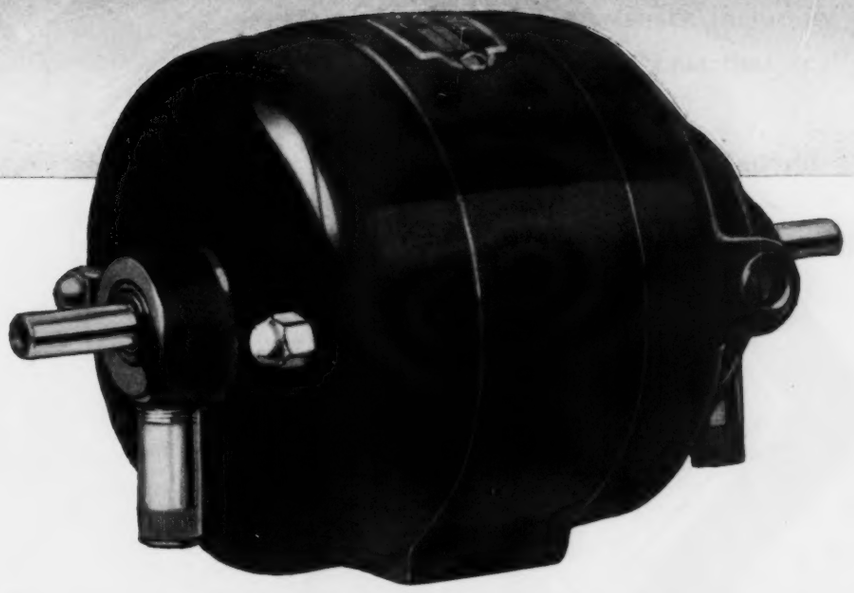
DUMORE

MOTORS
Are Used In

Electric Vacuum Cleaners
Electric Floor Polishers
Sewing Machines
Oil Burners
Grinders
Drills
Drink Mixers
Dental Engines

DUMORE

"...relieved by a Dumore motor



Universal Durability Required

DUMORE Motors enjoy a high and enviable position, because of one reason . . . they give unfailing power, and do so for a longer period of time, regardless of the kind of service.

Because of the uncertainty of service . . . because of their numerous different jobs serving various industries . . . Dumore Fractional Horse Power Motors are made to cope with all heavy assignments. Naturally, they are built first to assure *dependable service* . . . secondly, to keep *active longer* . . . third, to meet the *speed* and *load* of modern production methods. More than a quarter of a century of "motor making" has given this company invaluable experience, the benefits of which are embodied in every Dumore Motor.

Dumore Motors obtain speeds of from 10,000 to 12,000 R. P. M., but they develop their maximum H. P. at 5,000 to 6,000 R. P. M. For full details, and how efficiently Dumore Motors will work when applied to your product, write our Engineering Research Department.

THE DUMORE COMPANY
35 SIXTEENTH STREET RACINE, WISCONSIN

FRACTIONAL HORSE POWER MOTORS
ARE DYNAMICALLY BALANCED!

A new invention

Red
The improved G-E 880 paint
Blue
Green
Brown
Aluminum
Glyptal
REG. U. S. PAT. OFFICE
Lacquers

for long life

JOIN US IN THE GENERAL ELECTRIC HOUR. BROADCAST EVERY SATURDAY AT 8 P.M., E.S.T. ON A NATION-WIDE N.B.C. NETWORK

GENERAL

MERCHANDISE DEPARTMENT,

G-E Glyptal Lacquers

REG. U.S. PAT. OFF.

Protective coverings applied like paint

UNUSUAL finishes are now available—finishes that stick tenaciously to every surface including galvanized iron and aluminum; sealing agents that really seal; protective coverings that really protect!

Glyptal lacquers, an invention of the General Electric research laboratories, differ from commonly used paints and varnishes. They are unusually resistant to mineral oils, gasoline, kerosene, weak acids, and alkalies.

G-E Glyptal lacquers are furnished in several colors. In general, the same excellent characteristics are common to all. G-E Glyptal lacquers are easily applied by spraying, brushing, or dipping; they air-dry quickly; and all produce smooth, flexible finishes of high dielectric strength.

Red Glyptal lacquer is especially recommended for sealing oil, gas, and water leaks.

You owe it to yourself and to your company to investigate G-E Glyptal lacquers. Begin by examining the test strip. The coupon below, properly filled in, will bring it to you.

WRITE FOR *test strip and folder*

Merchandise Department,
General Electric Company,
Bridgeport, Conn.

Gentlemen:
Please send me the G-E Glyptal lacquer test strip and further information about these protective coverings.

_____

_____

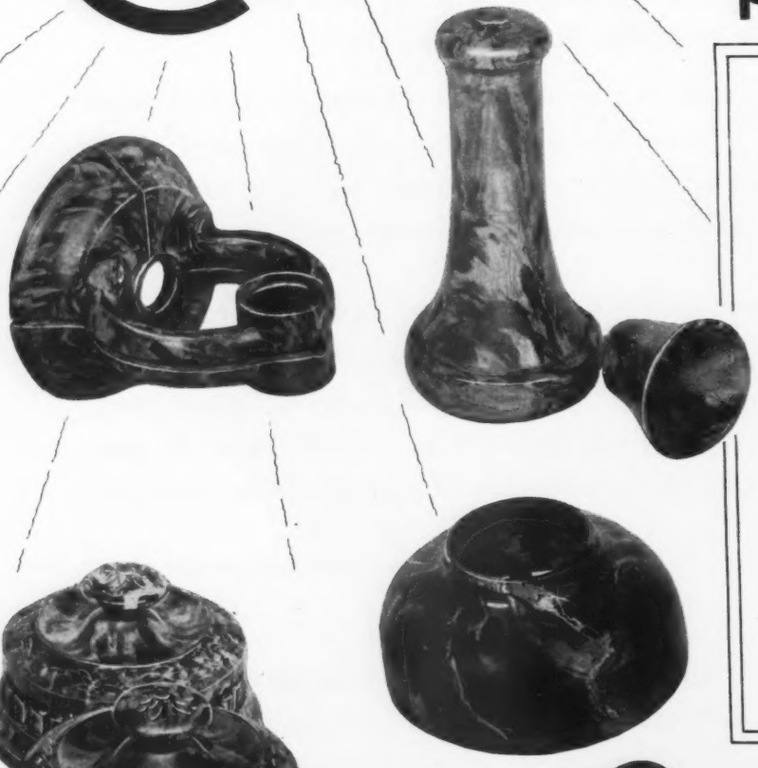
_____

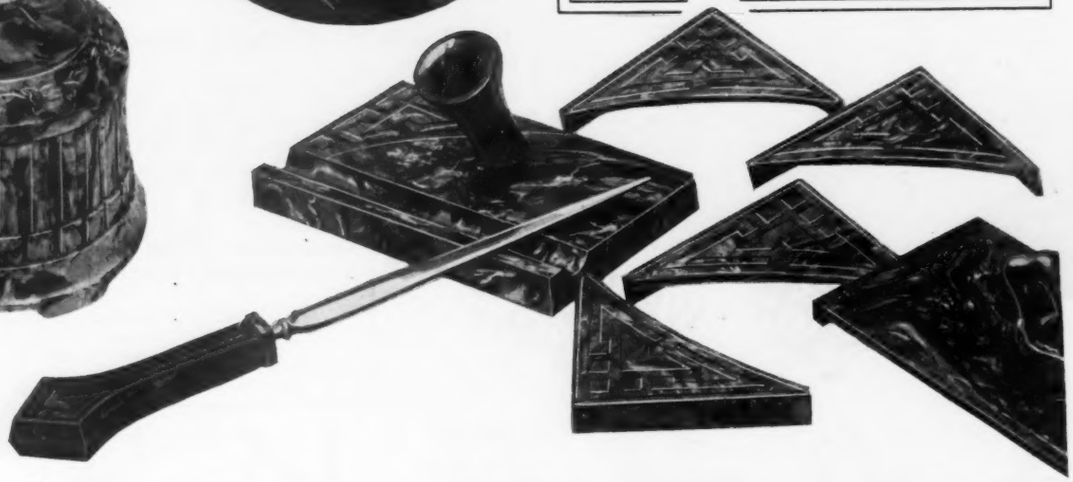
800-509

ELECTRIC

BRIDGEPORT, CONNECTICUT

Color in your molded products





Articles of every imaginable kind, in every color or tint the spectrum offers, can be molded of LUMARITH.

There is the richness and mystic beauty of true pearl; the quiet dignity of jade green with delicate traceries of black blending one with the other—LUMARITH provides countless numbers of color effects that appeal to today's (and tomorrow's) tastes.

LUMARITH is, also, desired because it is substantially non-inflammable, unbreakable, will not chip or crack and it can be cleaned with a dry cloth.

We shall, gladly, confer with you on the use of LUMARITH in enhancing the beauty of your product. Illustrations in full colors will be sent on request.

CELLULOID CORPORATION
10 East 40th Street, New York

LUMARITH

AMERICA'S MOST COLORFUL MOLDING MATERIAL

A box supply at your finger-tips . . . . . .

For immediate service, telephone the nearest H & D service unit

Albany	Main 2978M
Baltimore	Wolfe 7376
Boston	Stadium 6500
Bridgeport	Barnum 3955
Buffalo	Seneca 3156
Chicago	Superior 1332
Cincinnati	Avon 8405
Cleveland	Main 5732
Columbus	University 6319
Cuyahoga Falls	Cuyahoga 268M
Dayton	Main 223
Detroit	Glendale 4947
Grand Rapids	31439
Indianapolis	Riley 1188
Kansas City	Victor 5532
Louisville	City 644
Minneapolis	Atlantic 1833
Muncie	Main 2286
New York	Worth 1684
Peoria	45069
Philadelphia	Lombard 7381
Pittsburgh	Grant 6187
Richmond	Randolph 604
Rochester	Culver 2177
Sandusky	Main 304
South Bend	Main 3-1101
St. Louis	Evergreen 0220
Toledo	Main 8710
Toronto	Lakeside 4052
Montreal	Amherst 2174
Worcester, Mass.	Park 5437

H&D

Twenty-one mills and factories and thirty-one service offices in the Hinde & Dauch chain place the world's greatest packaging service almost at your finger tips.

From Kansas City to Boston and from Montreal to Richmond, Hinde & Dauch maintains a corps of packaging engineers who cover the entire industrial area of North America—the area in which your business is probably located.

Whether you have one plant or many, Hinde & Dauch can team-up with you at a single point, or at several, in meeting your shipping box needs. And the strategic location of every H & D unit promises close cooperation and quick delivery.

THE HINDE & DAUCH PAPER COMPANY
325 Decatur Street Sandusky, Ohio
Canadian address: King's Street Subway and Hanna Ave., Toronto

HINDE & DAUCH *corrugated fibre* SHIPPING BOXES

"Engineered Packages in The Electrical Industry" describes in detail how the service of H & D package engineers is placed at your command. Mail the coupon for a free copy.

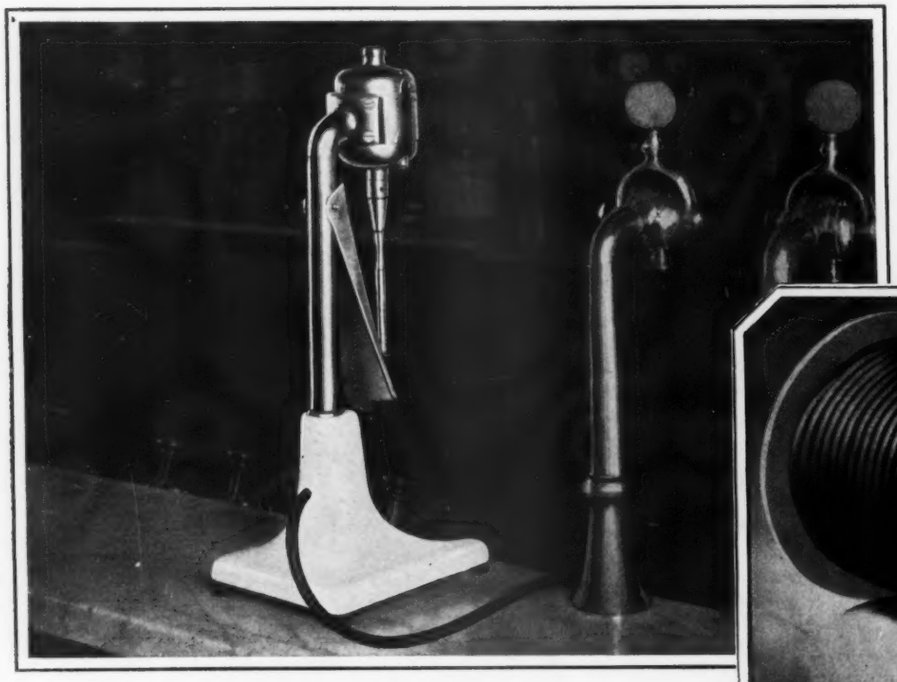
THE HINDE & DAUCH PAPER CO., 325 Decatur St., Sandusky, Ohio
Please send a copy of "Engineered Packages in The Electrical Industry" to

Name_____

Address _____

Town _____ State_____

We are interested in packing _____

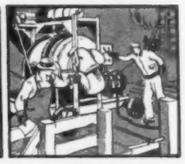


G-E Flex

the electric cord that requires no attention

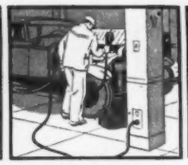
Lighting

Household Appliances



Construction Machinery

Electric Drills



Garages

Offices

Washing Machines

Vacuum Cleaners

Electrical appliances for soda fountains must be *always ready*... without tinkering, without service. G-E Flex all-rubber cord helps keep them so... helps maintain the good name of appliances *and* their makers.

G-E Flex is covered with heavy rubber especially vulcanized to withstand water, oil, steam, and the acid of fruit juices. It will not kink or crack open. Its long, moulded rubber plug is unbreakable and is safe and easy to handle wet or dry.

G-E Flex all-rubber cord is obtainable on spools, or in cord sets with rubber plug permanently attached. It serves with typical G-E dependability on any portable lamp or electrical tool indoors or out.

The coupon will bring you further details. Use it.

Section W-237, Merchandise Dept.
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Electrical Manufacturing

Production - Marketing - Administration - Repairing

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"Where Do We Go from Here?"

Electrical manufacturing executives, in common with those of other industries, have been asking what lies ahead in American industrial, commercial and economic life. An approach to an answer can be made through the findings of the Hoover Committee on Recent Economic Changes

Editor's Note: As an outgrowth of the President's Conference on Unemployment of 1921 three national surveys were made. The first covered Business Cycles and Unemployment. The second was a study of Seasonal Operation in Construction Industries. The third was a survey on Recent Economic Changes.

This last survey was begun in January 1928 and completed in February 1929. Herbert Hoover was chairman, and Edward Eyre Hunt, secretary. The Committee, whose membership included Owen D. Young, was directed to make a critical appraisal of the factors of stability and instability in our economic life.

The report of the Committee, which has just been published, is engaging the critical attention of American business executives in all fields. It is considered perhaps the most important economic report in many years.

A summary of the findings of the Committee follows. It spotlights facts and trends which deserve the closest scrutiny of manufacturing executives in all fields.

Characteristics of the Years 1922-1929

ACCELERATION rather than structural change is the key to an understanding of our recent economic developments. Gradually the fact emerged during the course of this survey that the distinctive character of the years from 1922 to 1929 owes less to fundamental change than to intensified activity.

Invention is not a new art. Transportation and communication are not new services. The facilitating function of finance is older than coined currency. Agriculture is as ancient as history. Competition is not a new phenomenon. None of the changes in distribution on which emphasis has been laid in the last few years is basically new. Hand-to-mouth buying is old; sudden changes in style and demand are familiar; there is no new principle in installment selling; cooperative marketing is no modern discovery; the chain store movement dates back at least 25 years. But the breadth and scale and "tempo" of recent developments give them new importance.

But while the period from 1922 to 1929 has been one of intense activity, the committee noted that this activity has been "spotty." Certain groups have been more active than other groups; certain industries busier than their neighbor industries, and certain geographical areas more prosperous than other areas.

While rayon manufacturers have worked at top speed, cotton mills have been on part time; while the silk hosiery industry, the women's shoe trade, and the fur business have been active, there has been depression in the woolen and worsted industry; while dairying has been prosperous, grain growers have been depressed. Coal mining has been in difficulties, and classes of wholesalers and retailers have been under grave economic pressure. Progress has been made toward more stable employment in seasonal industries, yet "technological" unemployment, resulting from the displacement of workers by improved machinery and methods, has attracted attention.

Geographical differences also were noted. The Pacific States have made an extraordinary advance; the South has rapidly developed as a manufacturing area; the East North Central Division has grown; while the New England States and to some extent the Middle Atlantic section have developed less rapidly and have experienced some difficulties in adapting their older industries to new conditions.

However, in spite of this variability, this difference in activity as between groups and areas and industries, the rising standard of living characteristic of this period was widespread, and has reached the highest level in our national history.

Speed Which Power Has Added to Production

CHARACTERISTIC also has been the rise in the use of power—three and three-quarters faster than the growth in population—and the extent to which power has been made readily available not alone for driving tools of increasing size and capacity, but for a convenient diversity of purposes in the smallest business enterprise and on the farm and in the home.

Factories no longer need cluster about the sources of power. Widespread interconnection between power plants, arising out of an increasing appreciation of the value of flexibility in power, and made possible by technical advances during re-

(The summary appearing on this and the following pages is abstracted from the two-volume report "Recent Economic Changes," published for the Committee and for the Government, by the McGraw-Hill Book Co., Inc., New York.)

cent years, has created huge reservoirs of power so that abnormal conditions in one locality need not stop the wheels of industry.

Spread in the Source and Use of Credit

THIS acceleration of forces and its resultant rising standard of living have been facilitated by a continuing supply of funds.

In the breadth of the sources from which capital and credit have been available and in the quickening method of their use, may be observed again the changes in speed and spread of our recent economic activity.

In former periods the savings funds of the American people were not alone adequate for our capital requirements. In periods of business expansion the demand for funds pressed heavily upon the supply.

The reverse has been found to be true in the period under review. For the larger part of this period not only did the earnings and savings of the people supply the additional capital for financing the rapid development of industry, but in addition they furnished several billions of dollars for loans to foreign countries.

Stimulated by the urge for funds to finance the vast production program of the United States during the World War, the number of shareholders in the country's business enterprises has grown enormously, according to all estimates; and out of increasing incomes these investors have continued to pour their savings into the stream of credit.

During the later months of the period covered by the survey a new tendency has been observed. Investors, as well as a large body of speculators, have invested through the Stock Exchanges not only their savings, but the proceeds of loans secured through banks and brokers, until the credit structure of the country has been sufficiently weighted to indicate a credit stringency, resulting in an abnormally high rate for call money and an appreciable increase in the rate of interest for business purposes. The consequences of this process can not be measured at this time, but they are factors in the problem of maintaining economic balance.

Price Relationships, Wages and the Cost of Living

THE period under review is perhaps too brief for a definite judgment, and we are as yet too close in point of time to get an accurate perspective, but the committee feels that in the field of price relationships, wages, and the cost of living is to be found one of the striking and significant developments revealed by the survey, and one which more than any other gives these years their distinctive character.

According to the best available statistics, in the period between 1896 and 1913, the wholesale price level rose on the average 2.3 per cent a year, but wages rose only a little more; so that their purchasing power advanced only 0.5 per cent a year. In the period from 1922 to 1927, prices declined on the average 0.1 per cent a year, while the purchasing power of wages rose 2.1 per cent a year.

In this latter period the fortunate synchronizing of a high wage level and a stationary cost of living created a phenomenon, new in degree, which has widespread influence on the economic situation, and which will bear close study in its details.

Relative Price Stability

THE increasing tendency toward price stability, both as between classes of commodities and in the price experience of individual commodities, was a characteristic of the period under review, tending toward a more equitable basis of exchange of products among the various groups. Price fluctuations seem to have been held within narrow limits during this period by a combination of factors: a more complete background of statistical information making possible better judgment regarding supply and demand on the part both of producers and consumers, prudence on the part of management, cost reductions by technicians, skill on the part of bankers, an enlightened attitude on the part of labor, and the expansion of foreign markets.

Relative price stability has involved a change in the direction in which business men look for profits. Profits made from the fluctuations of individual commodity prices, and from changes in the relation among prices, have tended to diminish.

Whether the price relationships of recent years prove to be transitory or permanent, they represent today a huge gain which is reflected in all parts of the economic organism.

Production Increase and the Expansion of Human Wants

PARTLY as a result of this newly sensed principle of an accelerated cycle of production-consumption, and partly by reason of the development of a stream of credit and an abundance of flexible power made broadly available, the years 1922 to 1929 witnessed a marked increase in the physical volume of production. Some years stand out more conspicuously than others; two—1924 and 1927—show minor recessions; but the period as a whole has been notably consistent.

Since 1922 primary production has been increasing 2.5 per cent a year; manufacturing, 4 per cent; and transportation, 4 per cent. Taking 1919—a year of fair harvests—as a base, crop production in 1922 was 102; in 1925, 104; in 1927, 106.

There have been prosperous periods in the past which may have surpassed these rates of increase, but none so far as the committee can learn which has shown such a striking increase in productivity per man hour. Notwithstanding the reductions in hours of labor, per capita productivity is nearly 60 per cent greater than it was toward the close of the nineteenth century; the increase in per capita productivity in manufacturing from 1922 to 1925 was 35 per cent; the productivity of farm workers has increased at a rate probably never before equaled.

Optional Consumption

THE committee finds, from study of the fact-finding survey on which this report is based, that as a people we have become steadily less concerned about the primary needs —food, clothing and shelter. We have long since lost all fear concerning our food supply, and so we no longer look on food as a luxury or as a primary source of pleasure. American food standards have risen, but we hear little of the "high cost of living," and the slogan of the "full dinner pail," is obsolete. We wear less clothing; more rayon and silks, less cotton and wool. Our wants have ranged more widely and we now demand a broad list of goods and services which come under the category of "optional purchases."

The rapidly increasing number of families in the United States having a considerable margin of earnings available for "optional consumption"—optional in the sense that this portion of the income may be saved or spent, and if spent the manner of its spending may be determined by the tastes of the consumer or the nature of the appeals made to him by the industries competing for his patronage—presents one of the marked characteristics of the recent economic situation. It is the personal or individual expression of the gap between rising wages and the relatively stable cost of living, referred to at the beginning of this section.

Consumption and Leisure

CLOSELY related to the increased rate of production-consumption of products is the consumption of leisure.

It was during the period covered by the survey that the conception of leisure as "consumable" began to be realized upon in business in a practical way and on a broad scale. It began to be recognized, not only that leisure is "consumable," but that people can not "consume" leisure without consuming goods and services, and that leisure which results from an

increasing man-hour productivity helps to create new needs and new and broader markets.

The increasing interest in the fine arts and in science; the increased sales of books and magazines; the increase in foreign travel; the growing interest and participation in sports of all kinds; the domestic pilgrimages of some 40,000,000 motor tourists who use more than 2000 tourist camps; the greatly increased enrollment in our high schools and colleges; the motion picture theaters and the radio—all these reflect the uses of increasing leisure.

"Mass Services"

THE service functions are not new, but few of the developments revealed by the survey are of greater potential significance than the accelerated growth of our service industries—travel, entertainment, education, insurance, communication; the facilities of hotels, restaurants, delicatessen stores, steam laundries, and public libraries, to mention but a few.

An evolution which has been going on for centuries has only recently been revealed as a mass movement. We now apply to many kinds of services the philosophy of large-scale production. We have integrated these services and organized them, and we have developed the new philosophy to such a degree in recent years that we now have what might be "mass services." These have helped to create a new standard of comfortable living in the United States, and have afforded employment for millions of workers crowded out of agriculture and the extractive and fabricating industries. It was, in fact, the timely development of "mass services" which saved our country from a critical unemployment problem during recent years.

No serious cyclical fluctuations have characterized the period under review, so that the unemployment due to the business cycle has not been marked; but it has become evident that unemployment can arise as a result of industrial efficiency as well as of inefficiency. In the latter case we have seasonal or intermittent unemployment; in the former case what has come to be known as "technological" unemployment resulting from the introduction of new machinery and processes. The survey seems to indicate that the time has come to devote continuing attention not only to the problems of cyclical unemployment but also to this newer problem of "technological" unemployment if we are to forestall hardship and uncertainty in the lives of the workers.

Our Natural Advantages

IT is obvious, of course, that the economic position of this nation is in no slight degree due to our possession of abundant raw materials and sources of power, to the fact that our domestic market is so large, and that there are no trade barriers between the states. We can exchange goods without stopping them for inspection or the payment of duties between states. We can effect their transfer without the barriers of differing languages or customs. Advertising is peculiarly effective because we have so great an area with a common language which enables us to talk to all the people and to develop national consumption habits, which in turn make possible large-scale production.

The balance which has been maintained between consumption and production is nowhere better shown than in the fact that wages have been rising, and that there has been no striking increase of unemployment in a period marked by the broadest technological advancement which we have yet known.

Perhaps the deepest economic significance of the new situation lies, not in the rapidity with which the service industries have grown, and have become integrated, nor in the universality of their spread, but in the fact that the situation which they have created is reciprocal. Our increasing standard of living is not participated in only by those who produce our food, clothing, and shelter, but has flowed back to those in the service industries. The population as a whole can enjoy the rising standard of living.

Remote Saturation Points

THE survey has proved conclusively what has long been held theoretically to be true, that wants are almost insatiable; that one want satisfied makes way for another. The conclusion is that economically we have a boundless field before us; that there are new wants which will make way endlessly for newer wants, as fast as they are satisfied.

We have the power to produce and the capital to bring about exchange between the producing and consuming groups. We have swift and dependable transportation. We have an educational system which is steadily raising standards and improving tastes. We have the sciences and arts to help us. We have a great national opportunity.

Important as is the development of the economic side of our national life, through invention and discovery of new industries and new callings, an illustration of the potentialities of further lifting the national standard of living, without developing another invention or discovery and without creating a new want, can be drawn from a single industry—that of electrical appliances.

A survey of city and village homes indicates the use of electricity for many additional applications of highly specialized devices. In 1928 apparently a large percentage of the homes wired for electricity had electric flatirons; less than one-third of them had washing machines; slightly over one-third of them had vacuum cleaners; less than 5 per cent had electrical refrigerators. We are far from the saturation point in connection with any of these devices.

To take one other example, there is, perhaps, no more dramatic illustration of a rising standard of living than the growth and development of radio in recent years. This newest application of electricity has found its way into millions of homes. On Jan. 1, 1928, there were 7,500,000 sets in use. Yet about 70 per cent of American homes are still without the radio.

We seem only to have touched the fringe of our potentialities.

Economic Balance

MANY influences have been at work during the period covered by the survey, welding the people of the United States into a new solidarity of thought and action. The telephone and telegraph, the automobile, the radio, and the railroads form lines of communication which have brought together East and West, South and North.

Other and less tangible influences reaching back farther into the past, but accelerated and strengthened by the experiences of the World War, have also contributed to our solidarity. Economic reorganization; the cooperation of business leaders, economic experts, and the Government; the general spread of information; the growth of trade associations; the cooperation of labor to increase productivity; the restriction of immigration—all of these have grown in importance in peace after their stimulation by the war.

Making for solidarity has been popular education which has increased amazingly. We are spending two and one-half billions of dollars each year on public and private education—an increase of 250 per cent in a decade. Expenditures for free college and university education have increased nearly 350 per cent in little more than 10 years.

While ours has been a period of great economic activity and industrial productivity, and of a degree of economic

(*Continued on page 62*)

Systematic Planning

Manufacturing

About 140 different pieces enter into the making of an electric fan and to produce them requires approximately 325 operations

FOR years Westinghouse Electric & Manufacturing Company has continually devised new tests of materials, workmanship, equipment, and performance, until to produce the Westinghouse fan entails approximately 220 machine and hand operations, and approximately 105 visual and test inspections, approximately 325 steps in all.

These tests begin upon the arrival of the raw material and parts at the plant and only end after the finished fan has been placed in the container for shipment to the consumer.

Although this article is written to explain the production and manufacture of all types of fans manufactured by Westinghouse, for the reader's convenience we are confining the discussion to one type or size; that of the 16-in. A. C. fan.

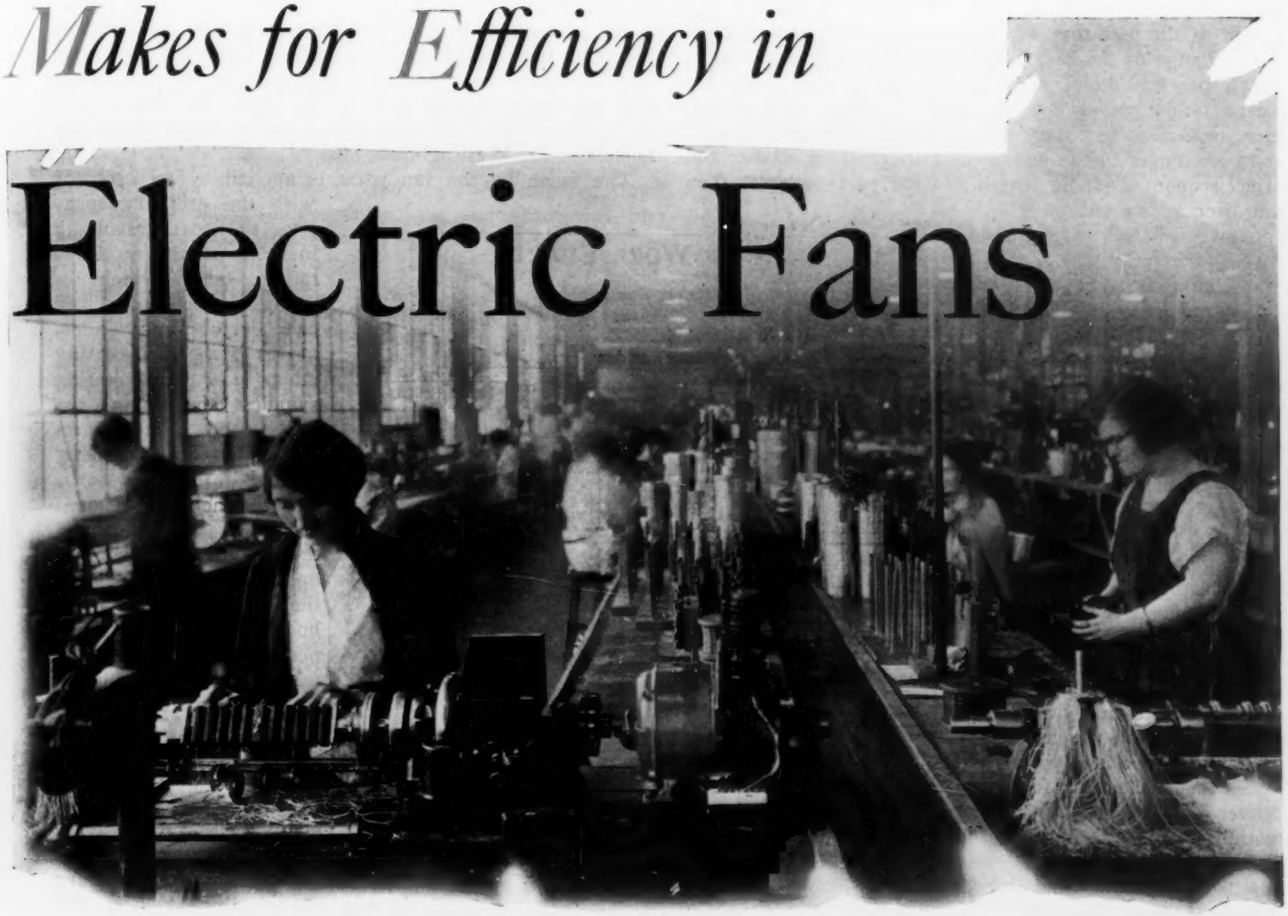
The number of parts that have to be manufactured, tested, and inspected to complete a Westinghouse 16-in. fan totals 140. Before entering the shop we might mention the engineer who must first develop a fan that the public demands and that is adaptable to the commercial field. The design must be practicable, serviceable, and a thoroughly developed fan from an engineering standpoint.

That proper supervision and knowledge of product is an essential feature in order to insure the consumer an instrument that is dependable, efficient, and silent, the

Practically every part and sub-assembly in the making of electric fans is handled by some form of conveyor in the Westinghouse Electric & Manufacturing Company plant, and the view at the top of this page shows some of these conveyors in operation, while the view immediately above shows women operators balancing and conforming fan blades in special fixtures

Makes for Efficiency in

Electric Fans



By T. O. ARMSTRONG

Westinghouse Electric & Manufacturing Company

Westinghouse keymen must not only be leaders but must know the individual assemblies and the general requirements of each component part necessary to complete this fan.

One of the most unique and interesting operations of this manufacture is the drawing operation on the fan base.

When making deep drawn shells from flat plated or sheet metal stock, it has always been customary to consider annealing between every second draw as a necessity. In this instance it must be remembered that annealing equipment is expensive and bulky, and where annealing is done, equipment and labor must be provided for cleaning the work after the annealing operation.

That there are cases where annealing is not necessary has been proved. The case for the 16-in. fan is made of .078-in. thick high grade cold rolled drawn steel and there are ten successive steps in the drawing of the fan base. The first operation, that of blanking is done in an ordinary round hole die of the push through type.

The second operation, first draw is done in the double action crank toggle press using a pressure pad. This operation establishes the diameter and the width of the flange which remains unchanged during the succeeding operations.

The remaining drawing operations are performed without the use of an inside blank holder. One of the illustrations shows the type of die used and shows a shell from the third draw in position in the die which completes the fourth draw. Each draw reduces the diameter and increases the length of the neck, at the same time gradually blending the neck and bell into the pleasing contour of the finished base.

At various intervals during these operations the parts are inspected using a micrometer for the size of the head, and a surface gage for the

As explained in the accompanying article, coils for Westinghouse electric fans are wound on a special type of fixture, some of which are shown in the machines in the view at the top of this page. The operator at the left in the view above is checking a fan rotor, while the man at the right of the illustration is shown balancing rotors in a special fixture

height of the part that will ultimately be the finished base.

The flange of the base is then trimmed and pierced after which the lead holes and slot for the control lever are pierced, the swivel housing hole is drilled and milled, then inspected for slug marks, missing operations, etc., and base moves to the washer and drier. This washer and drier is about 20-ft. in length and the parts are placed in the drier at one end on a conveyor chain which carries them through the washing and drying operations.

The parts first pass through into the potash which is circulated around them with the aid of a paddle-wheel, then through the hot water which splashes upward, washing each part as it passes through.

The parts continue through the heating and drying section which is heated by gas underneath where they gradually find their way to the other end of this heater and drier and are taken off the conveyor by an operator who places them on trucks for delivery to the polishing section. This process of cleaning and drying takes approximately 4 minutes.

Parts coming from the feeder sections to the polishing room are often scored and marked by the dies during the blanking operations, and it is essential that the surface of these parts be absolutely smooth before the paint or other finishes can be applied. In the grinding of the surface of the base a special polishing machine is used, the operator placing the base on a block which extends out from the machine (vertically) over which is an emery wheel which the operator bears down on the fan base removing all the scoring or other markings on it. The base is turned over to another operator who grinds and polishes the flange. Other fan parts are polished and ground in practically the same manner and on similar special equipment made for the purpose.

Another part made in the feeder sections for the manufacture of Westinghouse fans and manufactured similar to the fan base, as explained, is the case. This is blanked from the raw stock and is shaped out in one draw after which an inspector gages the inside diameter before it passes on for the piercing of the top, bolt, lead and lead hole bracket holes. The case is then drilled, trimmed and tapped for name plates inspected for slug marks, etc., then goes to the polishing room for polishing.

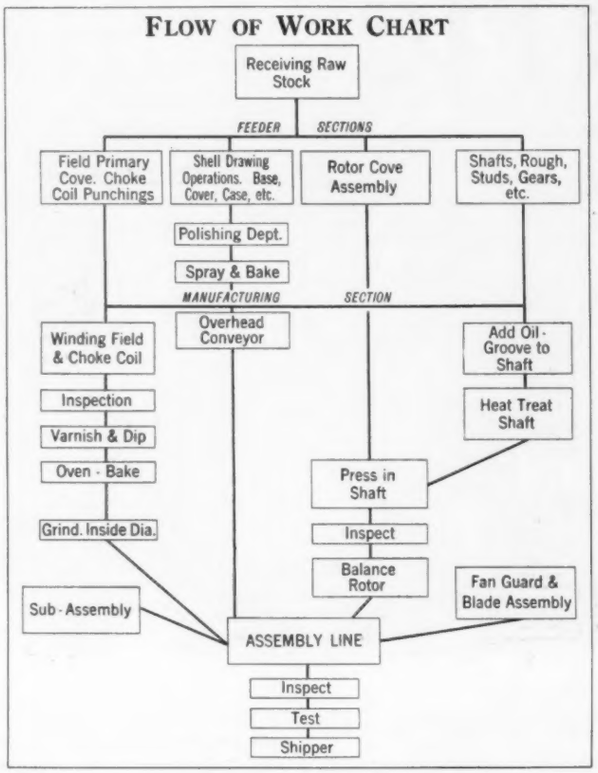
This same procedure with few exceptions is followed in the drawing and blanking of the fan cover, swivel cover, and case, base cover, connecting rod, etc. After receiving their polish and having been inspected for marks and appearane they are then delivered to the fan motor manufacturing section and to the spray and bake oven for application of the final two coats of finish which are applied to the Westinghouse fans.

The finish on the fan parts is applied by an operator with the ordinary spray gun, the parts revolving in front of him on a rotating table which is driven by a motor and belt drive from underneath. On this rotaing table are 12 rotating spindles that spin the bases and other parts while the finish is being applied by the operator.

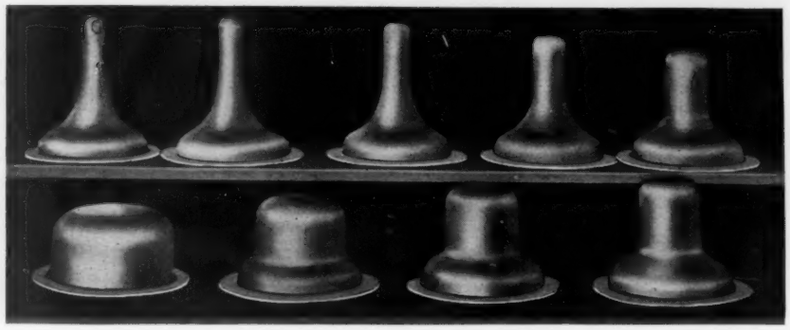
After each part has received its second coat of the rubbing finish another operator removes it from the table and places it on hooks on a conveyor nearby. This carries the parts upward through a drying oven about 30 ft. high in which there is a steel chain with cross bars 6 ft. wide on which the parts are placed. This chain turns slowly carrying the fan parts up into the heat where they are electrically baked at 210 deg. Centigrade for a period of 55 minutes.

They then reach the open air and are conveyed to their proper places in the general fan motor assembly line with the aid of an overhead conveyor that passes up over the main aisle and down to the assembly benches for assembly with their component parts.

It might be mentioned at this point that conveyor equipment plays a large part in the transportation of parts from one section to another and to and from each operation so that the human hand does not lift or carry these parts any more than is absolutely necessary. In addition to these modern manufacturing installations there are a num-



Every step and operation in the manufacturing of electric fans in the Westinghouse plant is carefully planned in advance. The chart above shows the manner in which the work flows through the various departments, from one, consecutively, into the other



There must be no marks or scratches on the metal parts entering into the construction of Westinghouse electric fans, and for this reason all of the parts are carefully made. Above may be seen nine of the ten steps required in the making of the fan base

ber of power machines, tools, special equipment, etc., that cannot be purchased on the open market that make possible accuracy and mass production.

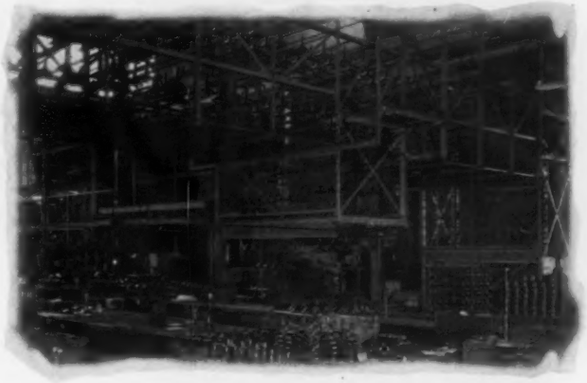
The fan rotor core is also made in the feeder sections, first the punchings are made from the flat sheet stock, punched out of scrap centers in an automatic punch press, they are then assembled, riveted together, soldered, and skewed, the center hole reamed, and then inspected for perfect roundness after which they are also conveyed to the fan manufacturing section for the assembly of the shaft.

The shaft is made in our screw machine department on a multiple spindle machine as well as other parts, such as worm, worm wheel, gear, caps, core, screws, spacers, studs, pins, springs, etc. The shafts are delivered to the fan manufacturing section soft and rough turned, upon receipt of which they are placed on lathes for qualification as to the journal length of the shaft. After this operation the shaft goes to the hand milling machines for the addition of the spiral oil grooves cut on a special Westinghouse fixture mounted on these millers. The shafts then proceed to the spot drilling automatics to be spot drilled for the seating of the fan hub. The next operation to be performed is the milling of the shaft tang which drives the worm or revolving gear of the fan and this operation is done on a vertical miller having a semi-automatic rotating fixture. The shafts then proceed to the heat-treating department for heat treatment after which they are returned to the fan manufacturing section to be straightened and ground to limits of ±.0003 in. They then go to the inspection bench before assembly to the rotor.

The first operation performed on the rotor after its receipt from the feeder sections is the rough grind on the outside diameter. This is done on a centerless grinder which finishes them at the rate of 400 an hour.

The rotor is now ready for the shaft assembly which is pressed into it with air pressure after which the outside diameter of the rotor is again ground from the shaft center when it is ready for balancing.

The rotors are delivered to the operator on a conveyor who places them on a pair of level, knife-edge pieces of steel and if the rotor is out of balance it rolls on the ways, the heavy side to the bottom. Small holes are drilled into the heavy side of the rotor until the excess material is removed and the rotor balances perfectly. The slightest degree of inaccuracy will produce a noisy, and out-of-balance fan.



Another view in one of the assembly departments of the Westinghouse Electric & Manufacturing Company electric fan making plants. Notice the extensive arrangement of conveyors, seemingly of many different kinds, moving in all directions

The accuracy of the shaft and bearings is then checked by another operator with the aid of a gage that measures to one-thousandth of an inch, after which the complete rotor with its shaft assembled is ready for assembly to the complete fan on the main assembly.

The assembly of the primary core is another essential feature made up in the feeder sections similar to the rotor in that it also is blanked out from sheet stock, and is assembled and riveted.

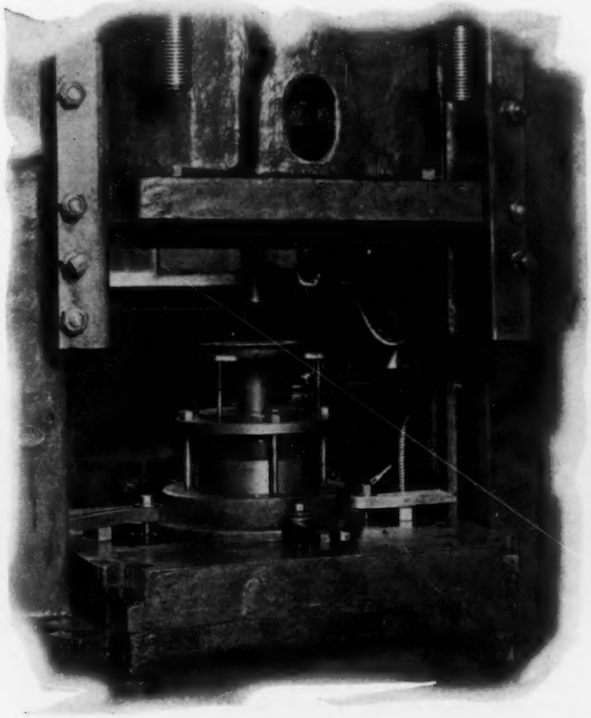
Inspection plays a large part in the manufacture of the primary core and girls are kept busy throughout the working day sorting and inspecting the individual punchings before assembly. The cores are then delivered to the manufacturing and assembly sections for the winding and assembly of the primary in which section it is interesting to note the flow of work passing from one operator to another down through the straight line and progressive assembly conveyor.

Specially constructed machines of Westinghouse design and make driven by Westinghouse type induction motors with double action break shoes are used throughout for winding the field coils. The coils are wound on a special Westinghouse constructed mold, winding four sets of coils (four in a set) in one loading operation. These machines are equipped with dials and adjustable stops that are set to do any number of turns required. This adjustable stop on the dial controls the accurate stopping of the motor.

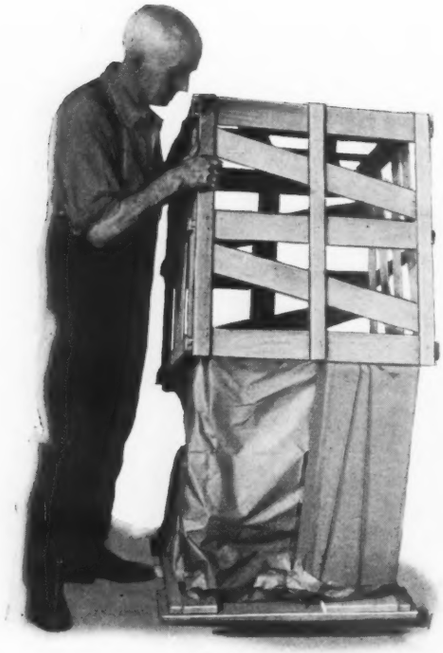
After the sets of coils are wound, the mold is then removed by the operator pressing the foot lever that releases the tail-center. The coils are then removed from the mold by sliding the mold blocks from the shank of the mold. The blocks are in turn replaced and the operation is repeated. Approximately 400 sets of coils a day are made in this manner on one of these machines.

After the removal of the coils from the mold they continue down the traveling conveyor to be carried to the next operation which is that of assembly into the field core. The core is taken from the conveyor and placed in a winding clamp and is first lined or insulated with insula-

(*Continued on page* 64)

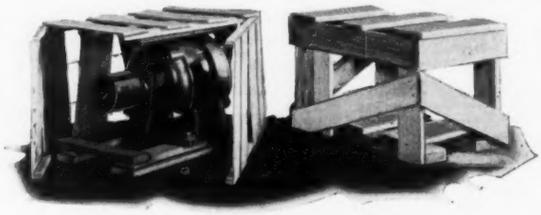


This is the type of machine used in the metal drawing and forming operations in the making of Westinghouse electric fan parts. On the machine is a specially constructed forming die with one of the fan parts in place in the die



Wooden Boxes f

Too much care cannot be exercised in the design and construction of wooden shipping boxes, as millions of dollars are lost annually because of faulty design, poor construction and defective materials



IN THESE days of quantity marketing, when millions of dollars are being spent in gaining the user's confidence in the merchandise offered and in building dealer and consumer good will, the condition of the goods when they reach the ultimate consumer is vitally important to the manufacturer, the jobber, and the dealer.

It is well, then, for shippers to consider carefully every element that enters into the transporting of this merchandise, from the time it leaves the factory until it is placed in the hands of the final buyer. A sturdy well-made container which adequately protects its contents is really a form of business insurance. Few commodities cost less to produce than the container in which they are shipped, and most commodities cost many times as much; hence the use of types of containers and methods of packing that will assure safe delivery is good economy.

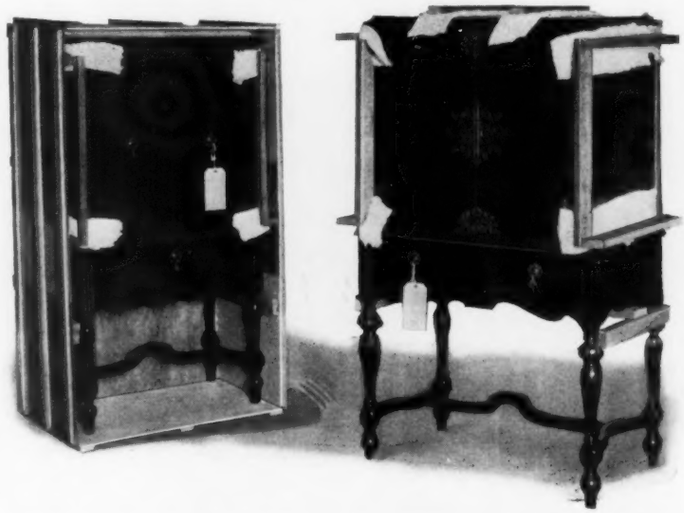
The constant receipt of merchandise in bad order by the dealer or user is bound to react unfavorably on both the jobber who has sold the goods and the manufacturer who has produced them. Aside from the direct losses that occur through inadequate packing, this indirect loss in good will is in itself a sufficient reason for employing proper shipping containers.

Goods are packed in containers either to protect them while in transit and storage and insure their arrival in perfect condition, or for convenience in handling.

Of the more than two and a half billion boxes of all kinds accepted annually for transportation by the railways of the United States, an average of 1 in 55 is damaged in transit to a degree threatening injury to its contents; for wooden boxes the ratio is 1 in 78, according to a report of Freight Container Bureau, American Railway Association. Direct losses attributable to insecure packages each year run into millions of dollars, much of which could be prevented. The amount of concealed loss and damage for which no claim ever is filed or paid can only be guessed. That these losses continue to occur is irrefutable evidence that many containers that are unequal to the ordinary hazards of transport are used.

The tremendous volume of goods shipped does not permit delicate handling of containers; occasionally they are handled roughly. While damage thus results to contents that are improperly packed, the loss is probably unimportant compared with the cost of the extra time and labor that would be involved if the transportation companies gave each package special attention. Properly designed and nailed boxes will withstand the hard knocks of ordinary transport.

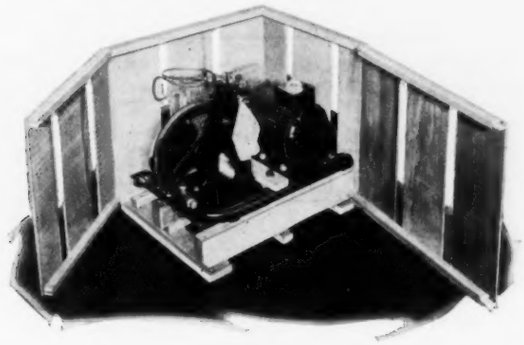
Transportation costs are based upon the value of merchandise carried, its susceptibility to damage, the volume per unit of weight, and the manner in which it is packed for shipment. The character of the packing has a direct bearing upon the classification of merchandise in the rail-



On this page are shown two different types of wooden shipping containers. At the top is a crate for a clothes washer; in the center is another type of crate for an electric motor, while directly above is a plywood box for a radio receiver. In each of these there are certain problems of design and construction involved which it would behoove any shipper to discuss with those in authority before he attempts to build or make such boxes

for Electrical Products

ASIDE from the direct losses that occur through improper packing, the constant receipt of merchandise in bad order reflects unfavorably on both the jobber who sold the goods and the manufacturer who made them. It is well then for every shipper to consider carefully every element that enters into the transporting of his merchandise, from the time it leaves the factory until it reaches the hands of the consumer. A sturdy, well-made container that protects its contents properly is a good form of insurance

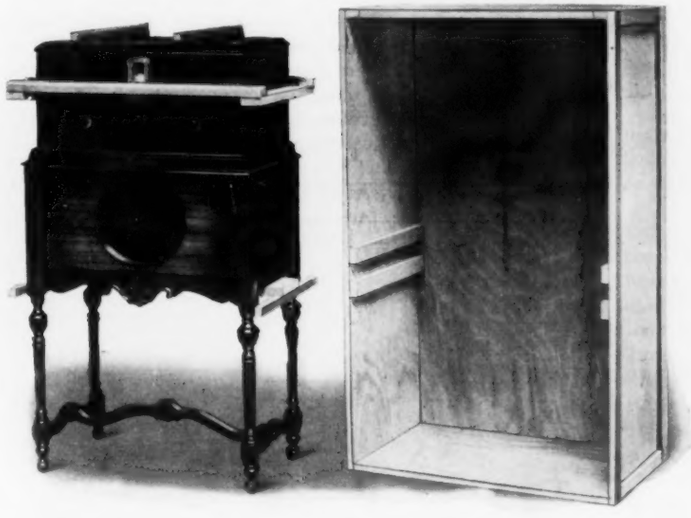


road tariffs. All railroad freight rates for "boxed" shipments are predicated upon the wooden box as a standard. Any commodities the carriers require to be "boxed" may be packed in wooden boxes, and there is no restriction on the size of box that may be used. Comparatively lightweight wooden boxes, when scientifically designed and properly constructed, are more serviceable than heavy, improperly constructed containers of any of the many types.

The scientifically designed and properly constructed nailed wooden box has a low initial cost and a low freight cost because of its light weight. It requires little storage space; knocked-down boxes are delivered in compact bundles and set-up boxes "nest" in storage.

In stacking, wooden boxes are self-supporting and require no special braces to keep them from tilting. Freight cars may be completely filled from floor to roof and from end to end.

At some stages of transportation containers may be subjected to extreme temperature changes and to humidity. Well-constructed wooden boxes resist these changes, and when properly packed they will protect their contents for considerable periods from spoilage in case of rain, snow, or dampness.



On this page are still other types of wooden boxes or shipping containers. That at the top is a wire-bound box for shipping a clothes washer; in the center is another type of crate for an electric pump, while that just above shows a different form of plywood box construction from that on the other page. Notice that the construction details of all of these differ from those on the opposite page, and all of these features of design and construction are largely governed by the products for which the boxes were intended

Rats and mice destroy large quantities of goods in transit and storage. Protection against their attacks is a matter of hardness, toughness, and thickness of the container wall, and in these respects wooden boxes are desirable.

Great numbers of packages are lost in transit because the addresses are defaced or are rendered illegible by moisture, dirt or abrasion. To a large extent the wooden box guards against these mishaps. The broad flat surfaces and light color of the wood lend themselves readily to effective stenciling, and the texture of the surface permits the marking ink to penetrate deeply.

Wood, by reason of its inherent toughness and hardness, is not likely to be dented or punctured by sharp objects. Wooden boxes, therefore, are not damaged by ropes cutting through them when tied on trucks nor readily punctured when hoisted in slings.

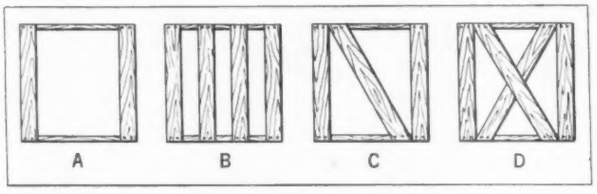
Resistance to racking and distortion is dependent in part on the secure fastening together of the separate pieces of the container and in part on the resistance of the box material to shearing and crumpling. Wood has been proved to meet these requirements satisfactorily when properly nailed.

Many types of boxes have cleats at the ends. Even lacking cleats, the right ends still afford good handholds, discouraging the use of hooks

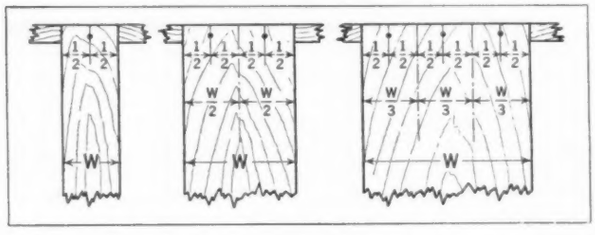
and lessening the possible danger of dropping in handling.

Doubtless the prospective shipper will ask how he may assure himself that his containers are scientifically correct in design for the commodity packed therein and for the transportation conditions to be encountered.

The design and specifications for wooden boxes are influenced by many factors, among them the size and shape, weight and value of the contents, compressive strength of the contents, and nature of the inside bracing and packing. Given these and other pertinent factors, a competent box manufacturer will be able to design shipping containers of the most economical type consistent with the safe carriage of the contents through to destination. Each box must be designed with regard to both the external shocks it will receive and the nature of the article it is to protect.



Four different methods of crate construction. Assuming that A has a strength of 100 units, two additional braces gives B 120 units, a cross-brace gives C 667 units, and the construction at D gives this type 1130 units, which indicates clearly the need for careful design and the use of good bracing in crates



Here are shown the proper spacing of nails in wooden boxes. This represents the recommended practice of the Freight Container Bureau of the American Railway Association and will serve to show the best proportions for materials of different widths

The value of the article to be shipped is an important consideration, for the shipper of valuable goods is justified in constructing a shipping case of exceptional strength to insure safe delivery.

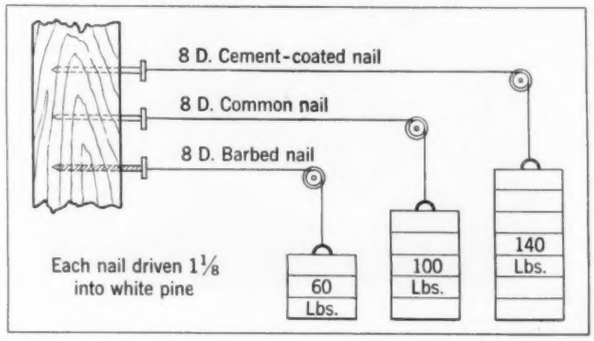
Nearly all the common American woods are used in box construction. The industry employs short lengths from the mills and parts of the log that are not in wide demand for other purposes. The utilization of this lumber (which is an unavoidable by-product to the manufacture of construction and factory lumber and which would in many cases otherwise be wasted) helps greatly to reduce sawmill overhead and to distribute more equally the cost of manufacture of all items produced from the log—in this way participating in the conservation of the nation's forests.

Some box lumber comes from the best parts of the log; much of it, however, as just indicated, is of low grade and must be used carefully to avoid weakening the box. The lumber chosen for containers should be free from holes and loose or rotten knots; boards with knots whose diameter exceeds one-third the width of the board, and boards having knots which interfere with proper nailing should be rejected. It is important that all box lumber be well seasoned; boxes made of wet or unseasoned lumber and permitted to dry out subsequently in storage have less strength than those made of well-seasoned lumber in the first place.

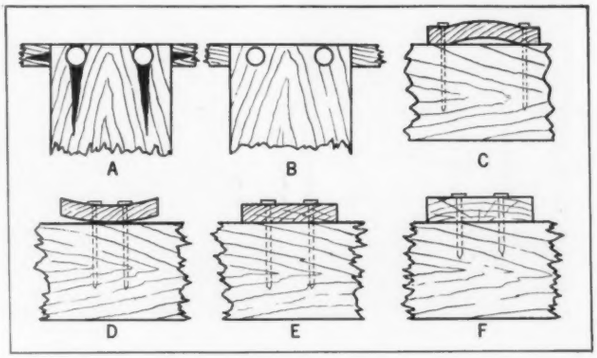
Since there are so many ramifications to the problems confronting users of wooden boxes it would not be practicable to enter into a discussion of box construction in the limited space of such an article as this. However, any manufacturer can freely discuss his boxing or crating problems with such organizations as the National Association of Wooden Box Manufacturers, The United States Forest Laboratories, the Freight Container Bureau of the American Railway Association or the United States Department of Commerce.

The illustrations accompanying this article were supplied by manufacturers of wooden boxes and those illustrations showing certain features of box construction were furnished by the Freight Container Bureau of the American Railway Association; other information was given by the Department of Commerce, for all of which ELECTRICAL MANUFACTURING acknowledges its thanks for this cooperation.

Among the illustrations it will be noticed that practically every type of wooden shipping container is shown. These include the ordinary wooden box, wire-bound boxes; plywood boxes and the simple shipping crate. Another shows the comparative strength of cross-bracing; one the holding power of nails of different types; a third different effects of good and bad nailing and the other proper spacing of nails in wood construction, all of which are more fully explained with the illustration.



A chart supplied by the Freight Container Bureau of the American Railway Association showing the holding power of different types of nails under the same conditions and driven into the same wood. It is clearly evident in this case that better results are to be obtained from cement-coated nails than any other common type



Here are some things to consider in nailing boxes and crates. A shows what would happen when nails are too large; B shows nails of the correct size and properly spaced; C indicates what happens when nails are placed too near the edge, and D indicates the reverse when nails are placed too close. E shows nails of the proper length and correctly spaced, while F indicates the use of nails that are too short for good service

Types of Enclosures for Industrial Motors

In the selection of motors for industrial use care should be exercised to choose the proper type of enclosure to suit the installation

By P. R. Shean
Westinghouse Electric & Manufacturing Company

THE application engineer has by no means settled all his problems when he has determined the rating of a motor for a given location. The next question he must settle is the type of motor needed, and the amount of protection that must be provided for the motor against conditions other than those affecting the horsepower and speed. Will it be safe to leave the motor "open to the weather," or must some special degree of enclosure be depended upon to keep the motor in operation and to protect the man who operates it? The chance of getting an open motor water soaked, or the hazard of accidents may more than balance the increased cost of an enclosed motor.

AFTER having determined the rating of a motor required for any installation the next question for the application engineer to answer is the type of motor and the amount of protection that must be provided. Inasmuch as there are several types of enclosures, all having different properties, and affecting the motor in different ways, each of them should be studied before making a selection. What these different enclosures are for and how they affect motor operation is explained in the following article.
—The Editor

The standard general purpose type of industrial motor is capable of delivering its rated horsepower continuously, with not over a forty degree rise in temperature. But this is an open motor. Its windings and commutator are unprotected except as the construction of the frame and bearing brackets afford a degree of mechanical protection.

Assuming that the location demands some form of additional protection, the simplest perhaps is the semi-enclosed motor. This is a motor with covers, either punched, or cut from perforated material, over all the openings. These covers are so designed as to offer minimum resistance to the natural ventilation of the motor, and at the same time give maximum protection against interruption of service. This means a compromise, and the covers have been made with perforations that will not permit the passage of an object more than half an inch square. On the smaller frames the covers are punched directly from a flat piece of sheet steel; on a few of the medium sizes they are cut from a sheet of perforated metal; while on the larger frames it is necessary to use a cast grid type of construction in order to get the needed stiffness.

Figure 1 is the standard open motor, while Figure 2 is this same motor with semi-enclosing covers. Such covers should be used where the men may be working close over the motor, or where there is the possibility of tools or other objects of like size being dropped into the machine. Although actually the addition of these covers causes somewhat less than a ten degree increase in temperature over that of the open motor, it is common practice to rate these machines at fifty degree rise.

In certain cities, local regulations require protective covers for electric motors. In Chicago for example, all direct-current motors must be fitted with semi-enclosing

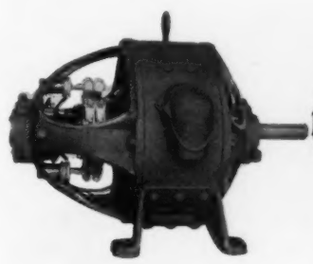


Figure 1

Figure 2

Figure 3

Figure 4

The four motors shown above are practically all the same insofar as mechanical and electrical details of construction are concerned, but all of them differ in the types of enclosures with which they are equipped. Figure 1 is the common open type motor; Figure 2 shows a semi-enclosed motor of standard design; Figure 3 is a motor fitted with drip-proof covers, and Figure 4 is a motor equipped with drip-tight semi-enclosing covers. Each of the different enclosures is intended to accomplish some specific purpose

covers on the commutator end, whether the nature of the application otherwise requires them or not.

Following the semi-enclosed, probably the most usual type of enclosure are the drip-proof and the drip-tight motors. These again are the standard open motor, but provided in this design with solid covers on the top openings of the brackets. The drip-proof motor, "so constructed or protected that its successful operation is not interfered with when subjected to falling moisture or dirt," has solid sheet steel covers applied directly to the top openings. The drip-tight motor, which must exclude all falling moisture or dirt, has these same covers, except with a cork gasket under them to make them fit tightly. On the larger frames, where the size of the opening to be covered is large, it is necessary to use a cast cover in order to secure the required tightness. In spite of the name, the more common application for these motors is in locations where the covers are desirable to prevent chips and small metallic particles entering the motor, as well as to keep out dripping moisture and oil.

Figure 5

Figure 6

Figure 7

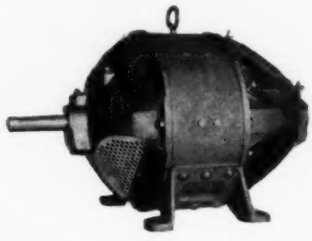


Figure 8

Here again is a group of four different motors, all of them being practically alike mechanically and electrically, except for the effects that the various types of covers might have on their performance. Figure 5 is another drip-proof semi-enclosed motor of the larger type with cast covers; Figure 6 is a motor with totally enclosing covers; Figure 7 is a self-ventilated drip-proof motor, and Figure 8 illustrates a self-ventilated, drip-proof motor with semi-enclosing covers

These motors may be provided with perforated covers on the lower openings as well, giving what is termed the drip-proof or drip-tight semi-enclosed motors. The addition of these extra covers furnishes increased protection against paper and other light material blowing about. The use of this type of enclosure means, ordinarily, that a larger motor must be used to do the same work as the open motor, if it is to be done without overheating. These motors are usually rated on a fifty degree rise basis.

Figure 3 is a motor with drip-proof covers, and Figure 4 shows the drip-proof semi-enclosing covers. The smaller drip-tight motors would look the same as the drip-proof shown in these illustrations. Figure 5 is one of the larger frames with the cast type of cover on the top openings.

In a few cases, where the operating conditions are particularly severe, a motor with still greater protection must be used. To meet this demand there is the totally enclosed motor. On this there are the solid covers like the drip-proof motor on all the openings. But where it is wished to use a standard forty degree open motor difficulty may be met. First, suppose the motor be given a fifty-five degree rating. Then assuming that it is a 575 r.p.m. machine, suppose it is speeded up about thirty per cent. Still possibly only sixty per cent of the original rating could be gotten out of the motor. The limitations of the totally enclosed motor come from the fact that all of the losses must be taken care of by radiation, and that none of them can be carried off by the natural ventilation of the motor. With a given frame size only a relatively small amount of heat may be radiated if the machine is to be kept within the fifty-five degree limit. If we increase the speed beyond a certain limit we reach a point where even the no load losses are too great to be radiated. Again since the losses are roughly proportional to the cube of a given external dimension, and the radiating surface is only proportional to the square of the same dimension, we soon reach a limit on the larger frames, unless we go to abnormal and correspondingly expensive designs beyond which it is not advisable to go. Therefore, on the larger frames and at the higher speeds it is impossible to obtain as good totally enclosed ratings as on the smaller frame sizes and at the lower speeds. This leads to a limit of approximately 50 hp. at 1200 r.p.m. above which it is impractical to build totally enclosed, continuously rated motors. Figure 6 shows one of the smaller motors of the totally enclosed type.

This motor is not air tight, the covers only preventing the circulation of any appreciable amount of air through the machine. For more complete enclosure there is the totally enclosed dust-tight motor, provided with gaskets under the covers as on the drip-tight motor. These covers practically prevent the circulation of any air through the motor, and the motor will operate satisfactorily under any except the most exceptional dust conditions. The totally enclosed dust-proof motor is used on such applications as cement and flour mills and other locations where the presence of dust in the air makes the use of anything but a specially designed motor undesirable. The sealed sleeve

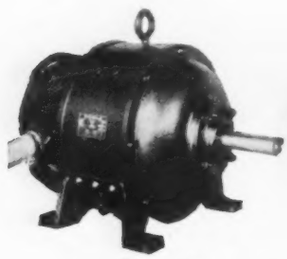


Figure 9

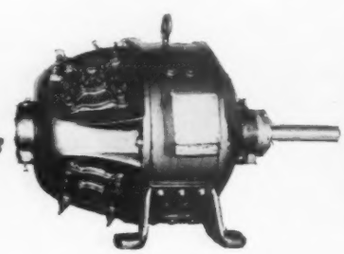


Figure 10

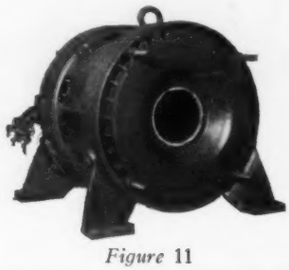


Figure 11

Figure 12

For conditions met with in mines, on oil tankers and like places where explosive gases may be present there is the explosion resisting motor like that shown in Figure 9. Notice the solid construction of the specially designed front and rear brackets. Figure 10 shows a typical water-tight motor, and Figures 11 and 12 two views of stators with the enclosing parts in place. In such motors the rotor blowers maintain a constant circulation of the internal air that aids in the transfer of the heat from the windings

bearings are especially adapted for use on this type of motor under these severe dust conditions.

An escape from the limitations of the totally enclosed motor is found in the separately ventilated motor. This is a motor with solid covers, but having inlet and outlet openings arranged for pipe connections. By forcing sufficient air through this motor a rating equivalent to that of the open motor may be obtained. It is this type of protection that is ordinarily specified for paper mill motors, and applications that require maximum protection against water and where a motor of comparatively high horsepower at moderate speeds is needed. Approximately 125 cu. ft. of air must be forced through the motor for every kilowatt of loss if the temperature rise is to be kept down to the specified limits. Care must be taken to see that this air is reasonably free from dirt. When from eight to fifteen thousand cu. ft. of air are being forced through the air ducts even a small percentage of dirt would be sufficient in a short time to coat the heat radiating surfaces with a layer of non-conductive material which might shorten the life of the insulation. Ordinarily the heated air from the motor may be exhausted into the operating room, but in warm weather this air, perhaps 15 or 20 degrees above the normal room temperature may prove somewhat of a problem; also if there are several large motors in the same room, the volume of this exhaust air may require that the outlet pipes be carried outside the building. This is also necessary if combustible dust is present.

For special applications where the separately ventilated motor with its connecting pipes might be cumbersome, and where a forty degree protected motor is desirable, we have a drip-proof self-ventilated motor. Again this is the standard open motor, but this time with a special built-in fan which offsets the restrictions of the enclosing covers. This motor is provided with solid covers on the top opening and is given a forty degree rating as is the open motor. Semi-enclosing covers may be added on the lower openings, providing the same protection as in the drip-proof semi-enclosed motor, with the added advantage of an increase of from twenty to thirty per cent in the rating over that of the drip-proof motor. Figures 7 and 8 show the appearance of this type of construction. The addition of the fan has increased the overall length of the motor from two to three inches, depending on the frame size.

Then, for the conditions met in mines, on gasoline tankers, and like places, where explosive gases may be present, we have the explosion resisting or "permissible" motor. This motor is so designed that any exploding gases inside the motor will be so cooled before they can leak out as not to ignite any gases that may be present in the air outside of the motor. To this end a solid rear bracket is used and a specially designed front bracket in which the openings for brush inspection are round and threaded to take the solid

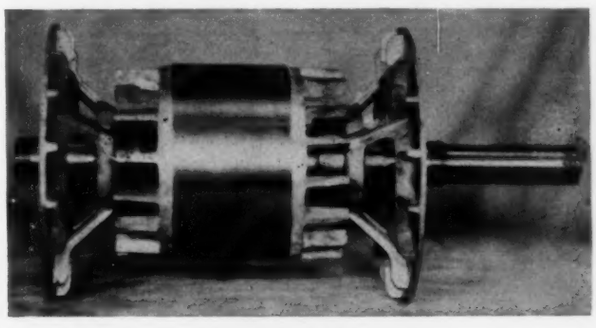


Figure 13

This is a typical rotor core showing the position of the external fans relative to the core. It is these fans in totally enclosed type of motor that aid materially in the circulation of cooling internal air

covers; and the leads are brought out through an armor covered protective sheath. This motor has been designed to meet the requirements and to pass the inspection of the National Bureau of Mines. Figure 9 is a good example of

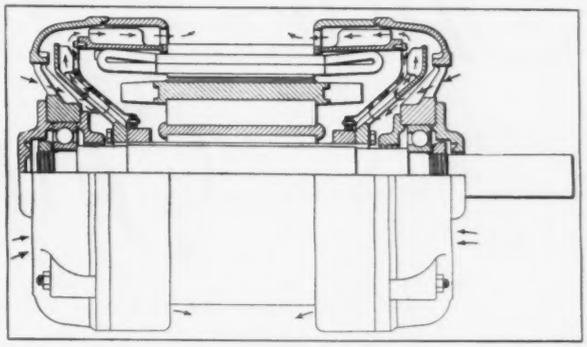


Figure 14

A diagrammatic view showing the arrangement of the parts in a totally enclosed motor, and at the same time the means provided for dissipating the internal heat through vents for circulating the heated air

this type of motor. Notice the covers and the lead construction.

Somewhat similar to this is the water-proof motor, with its covers screwed down to machined surfaces. This motor is designed particularly for marine use, on open decks and similar locations, where the motor may be submerged momentarily. The covers are fitted with glass

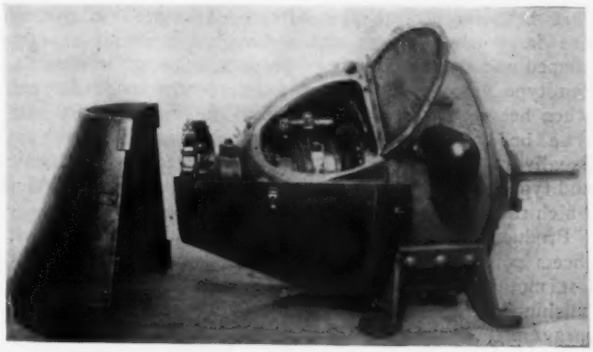


Figure 15

Another type of totally enclosed motor for direct current application. The enclosures are screwed down upon machined surfaces, sealed in with rubber gaskets, and the conduit connections are provided in a special fitting, welded to the frame

windows, sealed in with rubber gaskets, allowing a partial inspection without opening the motor. The special conduit box, welded to the frame, has a solid bottom cover as it is intended that the customer will drill and tap this cover to suit his conduit fittings. The ratings, and limitations, of both the water-proof and the permissible motor would be the same as on the totally enclosed motors. Figure 10 shows a typical water-proof motor.

The most recent development in enclosed alternating current motors for industrial use is the totally enclosed, fan-cooled motor with a squirrel cage winding. This is the standard open ball bearing motor with special enclosing parts and fans.

The cutaway view—Figure 14—shows this scheme of enclosure very clearly. Aluminum adapter castings are fitted into special grooves machined in the end shields of

(*Continued on page* 66)

Spray Finishing Fundamentals

By
PAUL W. COLLINS

In the first article of this series, published in June, spray painting auxiliary apparatus was discussed, while the following describes various methods

SALES competition has taught the public to demand color and with color comes the taste for good quality finishes. While the dipping process and the hand brush methods of painting are still used and will probably always be used to some extent, the spray method of finishing is probably now the most popular and at the same time is becoming more so each day for the application of practically any type of coating material to any surface.

In selecting spray equipment one must bear in mind that there are several types of spray guns. Some of these are faster than others and some give a round or cone shaped pattern while others produce what is termed the fan type spray. The faster guns require more air and when heavier materials are sprayed the volume must likewise be greater. Guns used on production work are usually of the types that may be adjusted as to volume and type of spray pattern to accommodate conditions under which the coating materials are to be applied.

Production methods demand speed. Production cost sheets point to the saving of floor space, elimination of lost motion, speeding up of deliveries, simplification of finishing methods, and a greater man-hour output in the spray method finishing room. The universal acceptance and use of spray equipment points conclusively to the fact that the spray method of application is here to stay. New developments and finishing short-cuts are constantly being evidenced. Greater finishing productivity is being attained with the aid of the spray gun. This is the age of speed; cost reduction; most value for the consumers' dollar.

Spray painting in some form with varying kinds of material is carried on in practically every industry in the electrical field. It ranges from the finishing of a huge transformer or turbine to the decorating of glassware or spraying inside small incandescent lamp bulbs. The process in each industry, and frequently each factory or workshop, involves a different problem. There are, however, certain essential items of equipment for spray finishing that may be likened to the fundamentals of spray painting. These essentials must be had or some substitute used in their place. By being familiar with these items, one can clearly see the simplicity of spray finishing and plan his finishing schedule and floor space to advantage.

The spray gun is a most essential item and should be selected from designs that lend themselves best to the particular surface to be sprayed, as was explained in the first article of this series, published in the June issue of ELECTRICAL MANUFACTURING. The gun's function is to properly mix compressed air and coating materials into a highly atomized spray and apply this spray as quickly and economically as possible. The manner in which the fluid is fed to the spray gun nozzle and the volume and pressure of the atomizing air are two points which must be carefully considered.

There are three methods of feeding fluid to the spray gun:

1—*With an Attached Suction Feed Cup*—This method is used, in the main, where the materials being sprayed are frequently changed in color or kind, or where one material of a given weight and color is sprayed less than three hours a day. From the foregoing, one can easily surmise that the cup gun is seldom used in production shops. There are instances when, due to inherent qualities of the material (bronzes and similar coating materials that will not stay in suspension long), suction cup guns are used in production spraying. Of course, the materials are reduced to spraying consistency.

Some spray gun manufacturers design their cup type guns to accommodate the standard Mason glass fruit jar with the screw top. This feature is very helpful to the shops having a number of colors for occasional spraying

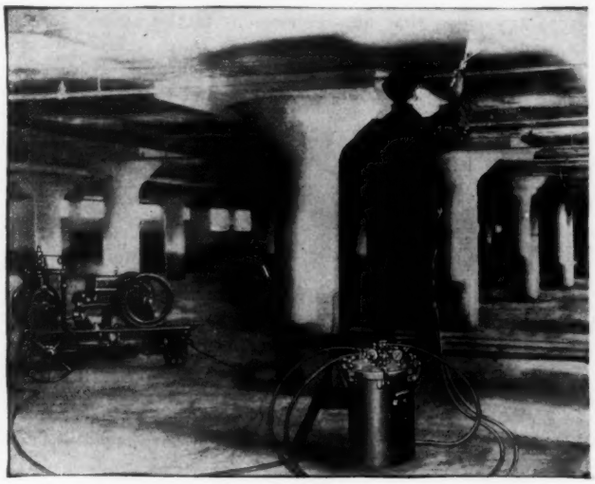


Figure 11

A gasoline engine driven, portable spray finishing outfit is shown in the illustration above. Many progressive factories today are spray painting their buildings and keep portable spray units such as this for their maintenance and upkeep painting work

as the Mason jars are easily obtainable, inexpensive, and afford a convenient storing receptacle that permits easy inspection of the color desired. There are guns on the market that apply an air pressure to the material in the cup attached to the spray gun. This arrangement permits the spraying of heavier liquids than would otherwise be possible with a cup gun. It is not advisable to use anything but a metal jar if pressure is applied to the liquid.

2—*Overhead Gravity Feed Containers*—The gravity feed system is used in some production shops where spraying is confined to one place and in small shops where the material being sprayed is too heavy in body to permit sufficient spraying speed when using a suction cup gun. The fluid is fed to the spray gun through a hose by gravity flow. The force of this flow is regulated by increasing or decreasing the height at which the container is suspended and the amount of material there is in the container. Gravity systems are inexpensive to install. The container may be made out of a bucket by soldering a fluid cock onto its bottom and fitting a lid to it. More gracious and adequate containers may be bought, however. They are obtainable in sizes of from 1 to 10 gallon capacities.

Figure 14 shows a gravity feed container with an air agitator fitted to the lid. Air agitation is seldom used, however, as the air circulating through the material frequently causes an undesirable reaction. Fire underwriters insist that the container be suspended by means of a pulley and fireproof cord. The container is generally suspended six or eight feet from the floor. The fluid hose is seldom more than 10 feet in length and should not be so long as to drop much below the level at which the spray gun is being operated. After use, the gravity feed container and fluid hose should be thoroughly cleaned inside and out.

3—*Pressure Feed Fluid Tanks*—This system of feeding fluid to the gun through a fluid hose is the most satisfactory for production shops. The sprayman may move any reasonable distance from the pressure feed tank, restricted only by the length of the hose. The pressure feed tank makes possible a constant and even flow of materials to the gun, irrespective of the quantity of material in the container. This feature is what has caused the pressure tank to supersede the gravity feed system as the latter system does not insure a constant even-pressured flow of material to the gun. Pressure fluid feed tanks range in sizes of from 1 gallon upward.

On production line painting, several pressure feed tanks are connected in series with valves between each tank. This arrangement permits an attendant to periodically service the containers and keep them filled without disturbing the operator or causing a halt in the production line. Some shops keep these batteries of pressure feed tanks in their paint or lacquer mixing room and pipe the material to the spray booth, thus eliminating extra handling and some fire hazard in sloppage. This system, of course, would be possible only where a given color and material is sprayed for a long period of time.

AT the right is a suction feed cup spray gun. Such apparatus as this is usually used on semi-production painting and finishing operations in which the requirements of the work or the product make necessary frequent changes of color and materials. These guns are admirably suited for this work, as the cups can be changed quickly

Figure 12

The Pressure Feed Tank is made up of three major parts:

1—The lid or cover
2—The bottom (outside container)
3—The insert (inside container)

There is a fourth part, which is optional, the mechanical agitator.

The Cover—On the cover is fitted all the necessary equipment for pressure regulation of air and material, inlet and outlet cocks, gages, safety valve, relief valve, agitator paddle, etc. The regulation for the atomizing air pressure is done at the transformer located at the air line outlet. This pressure varies with the nature of the material and the kind of work being done. Liquids of low specific gravity and viscosity require low atomizing pressure and, conversely, those more dense and of greater viscosity require higher atomizing pressure. This atomizing pressure ranges

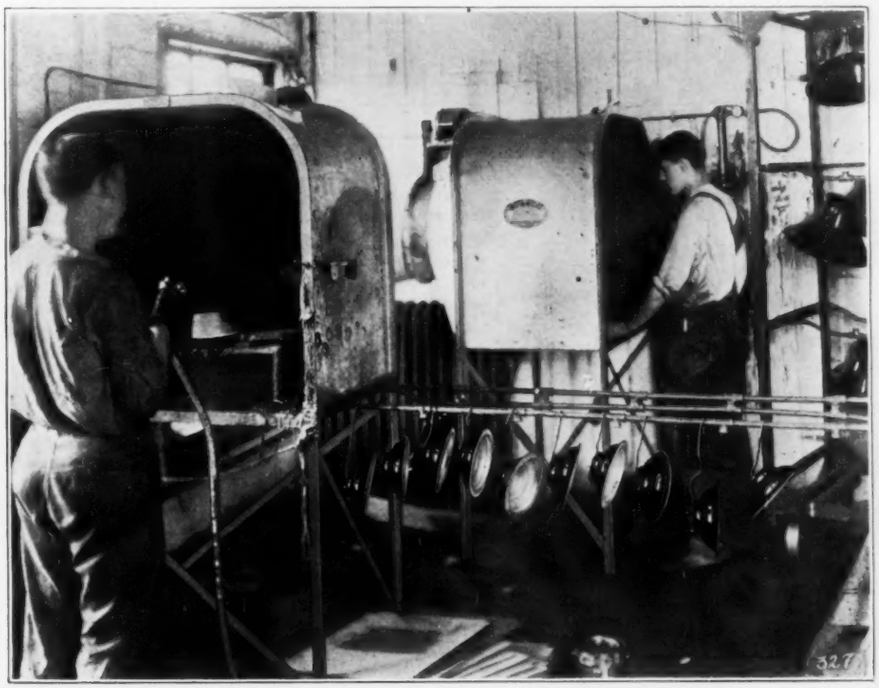


Figure 13

THE operator in the illustration (left) is shown spraying lighting fixture ceiling pieces. It will be noticed that the pieces are placed on a revolving table contained in the spray booth, after which they are coated and then hung on rods for drying. During the drying process these rods are transferred to racks. If the coating material were lacquer, the finish would dry quickly, but if the pieces were coated with a baking enamel these racks would be placed in heated ovens during the drying process. The spray booths shown are of the usual type now in general use, and they are fitted with an exhaust fan driven by a motor, and this equipment, which is highly essential, is all mounted on the back or outside of the booth

from 20 to 80 pounds. The regulation of pressure on the fluid depends greatly on such factors as the viscosity of the material, the length of the fluid hose leading to the spray gun, the size of the fluid hose, the speed with which the spraying is to be done, etc.

Figure 15, which shows three of many possible streams coming from the gun fluid nozzle. The heavily marked, middle line is the desirable angle of flow and gives a simple and effective test in ascertaining the correct pressure to be exerted on the fluid in the tank. This test is made with the atomizing air shut off entirely from the gun. The greater the pressure exerted on the fluid, the more forceful will be the stream. A smooth even flow is desirable. The air pressure in the fluid pressure feed tank is indicated on the gage screwed into the cover. The desired fluid pressure will vary from 2 to 10 pounds depending on the viscosity of the material, operating speed, etc. The atomizing pressure at the gun nozzle should be about seven times greater than the pressure on the liquid. Too high an air pressure or an excess of air volume for the material being sprayed will give a highly vaporized or "misty" spray, and frequently a distorted spray pattern. When the spray is misty, there is considerable waste of material in what is commonly referred to as "fog" or "spray dust." Too much pressure on the fluid will give a forked or "fish-tail" spray which is conducive to runs and sags with a consequent improperly atomized finish and the necessity of refinishing the product.

Figure 14

Gravity type feed containers are frequently used in spray painting such as that shown in the illustration above. These must be suspended overhead by some type of fireproof support, such as rope or wire cable. The air agitator shown with the container is seldom used

The Outside Container must be of sufficiently heavy stock to insure against its bursting or losing its shape because of the air pressure exerted on the fluid. This pressure should never exceed 60 pounds per square inch. The general construction is of seamless pressed steel sides with welded bottom. The inside is heavily plated to prevent rust or some other form of corrosion. If the tank has straight sides and a full diameter cover, it is much easier to keep clean and it makes it possible to use full capacity insert containers. Strong thumbscrew clamps are welded onto the sides of the container to hold the cover down evenly and to seal it against air leakage.

The Inserts are designed to slip inside the outer container. These are usually made of heavily tin-plated sheet steel to avoid any reaction of the materials that might be put into them. The inserts are fitted with a bail for easy handling and extra inserts may be obtained, fitted with covers. The use of extra inserts permits quick refilling of the tank and quick changing of colors. They also make it much easier to clean the container which is a great time saver.

Mechanical Agitators—Pressure feed tanks of 5 gallon capacity upwards are optionally fitted with agitator paddles. Agitators are needed when one is spraying materials of heavy body or delicate tint. Some materials require occasional agitation. Others require constant agitation. The agitator paddles may be worked either by means of a hand operated crank or by attaching an electric or air motor to the agitator shaft. Electric motors are frequently frowned upon by the fire underwriters. Air motors are the more popular. The agitator feature adds to the cost of the pressure feed tank.

In connection with the foregoing it is well to point out at this time that almost any kind of finishing material requires stirring or agitation, if best results are to be obtained. This need not be continuous, but at least should be periodical when large quantities of the materials are placed in the container. Likewise, cleanliness is essential to good results. Dirty spray guns, containers in which finishing materials have congealed and dirty surfaces to be coated are not conducive to good finishing. Then, when changing from one color to another, care should be exercised to determine that none of the original color remains in the spray gun or that part of the top of the cup which connects to the gun.

(To be continued)

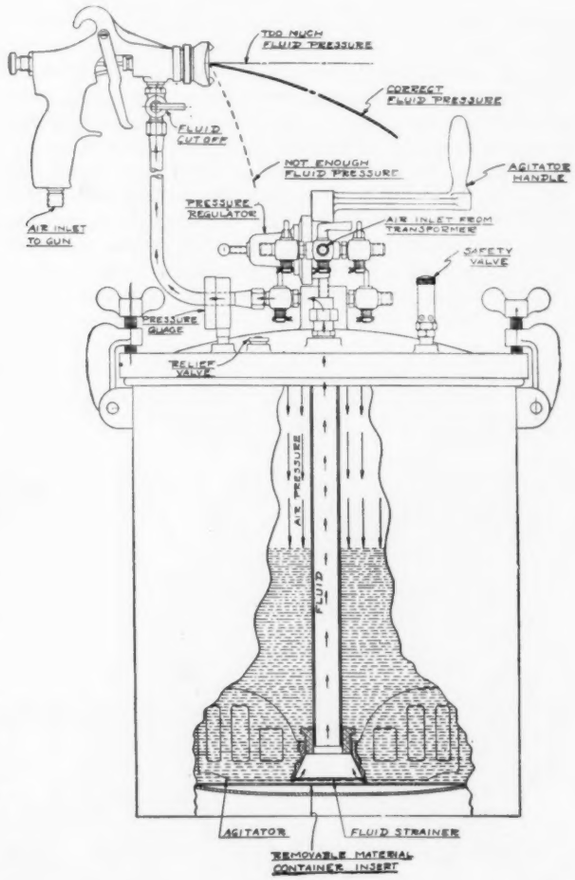
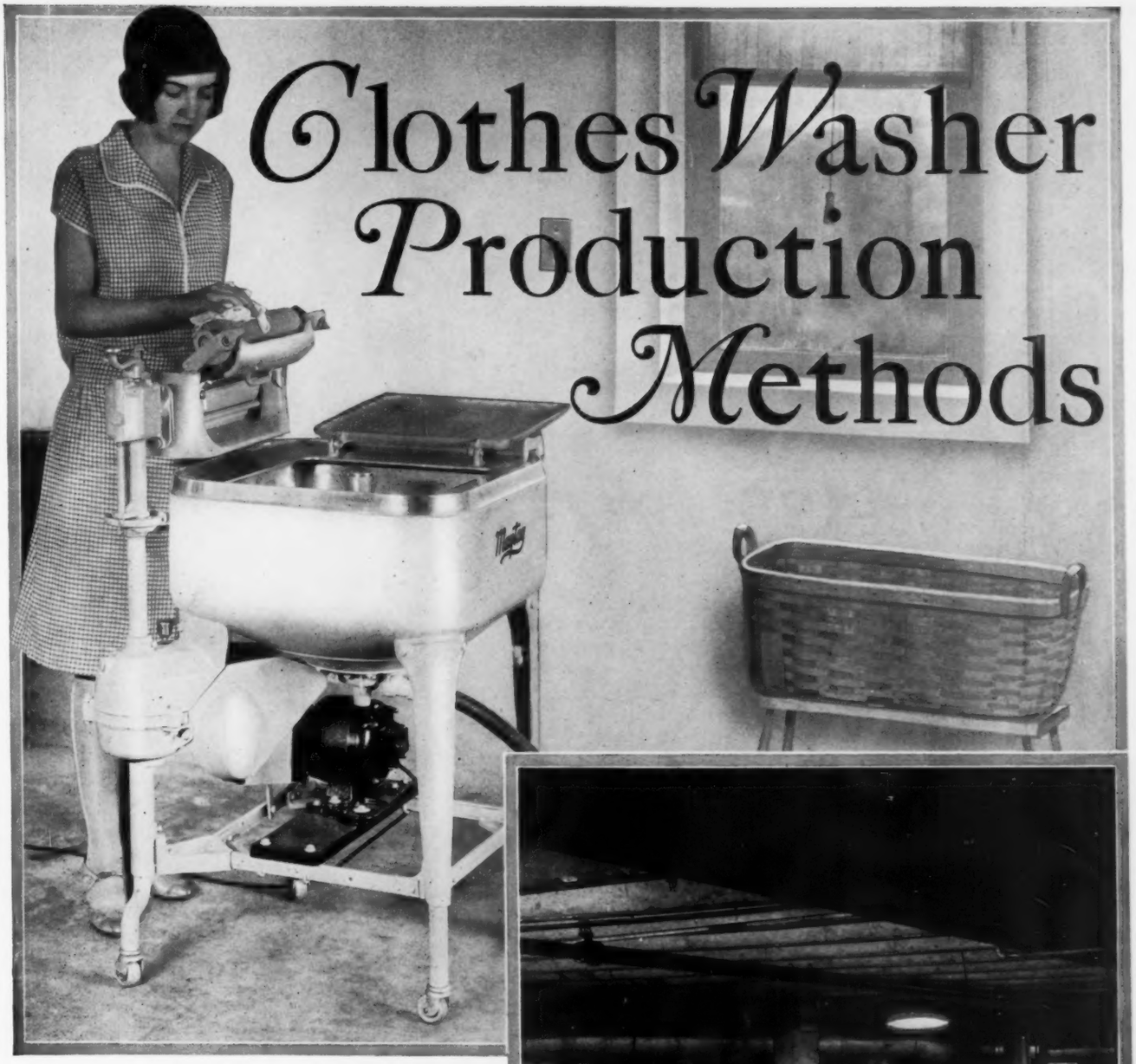
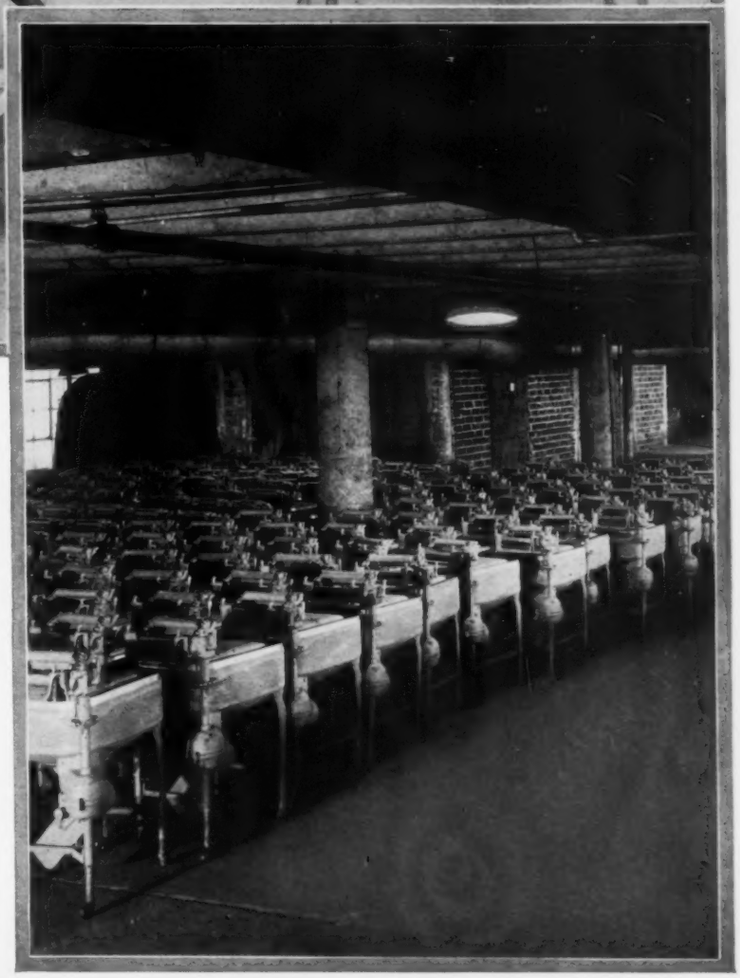


Figure 15

This is a diagrammatic sketch or sectional view of a pressure feed tank, which is one of the most popular methods employed in spray painting. The notes on the diagram, together with the text in the accompanying article, fully describe and explain the operation of this type of feed tank

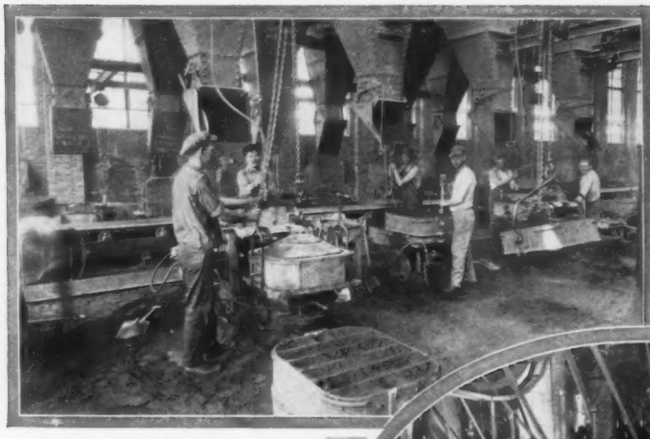
Clothes Washer Production Methods

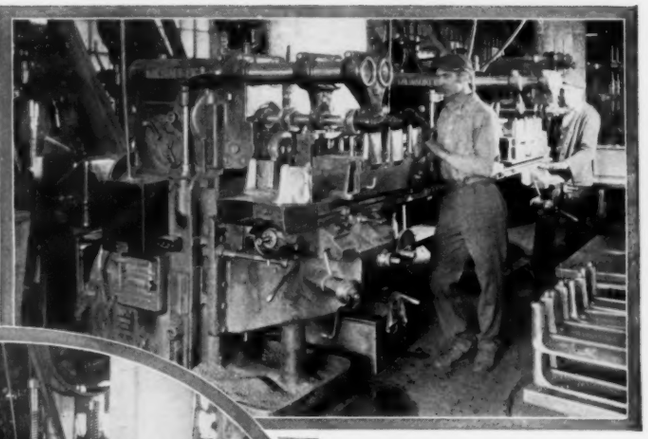


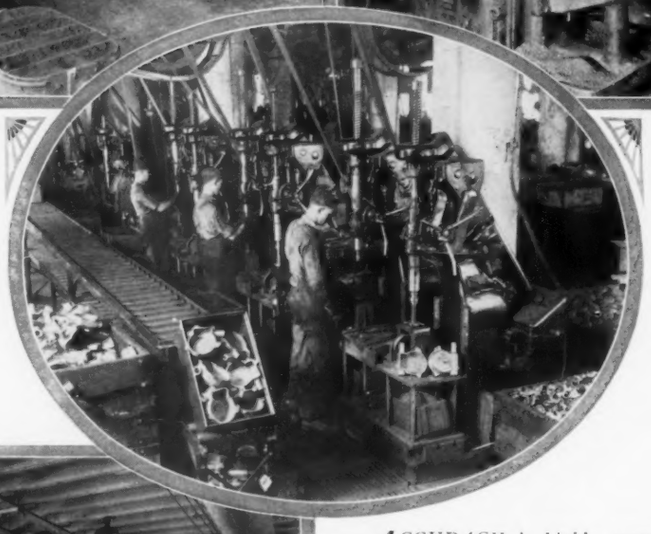


THROUGH the courtesy of the Maytag Company, of Newton, Iowa, ELECTRICAL MANUFACTURING *is permitted to present the illustrations on this and the two following pages, which show how the Maytag clothes washer is made. All of the manufacturing methods shown here have to do with the production of what the Maytag Company calls its "Aluminum Washer," which is shown in operation in the illustration at the top of this page. At the right is a great number of finished machines awaiting packing for shipment.*

From the other illustrations it will be noticed that Maytag clothes washers are produced in large quantities in a thoroughly modern factory, fitted with the latest types of manufacturing equipment. Every conceivable kind of labor-saving device has been made use of, including the best in machines and materials handling facilities, while production schedules have been most carefully planned to insure the best product possible at the lowest cost





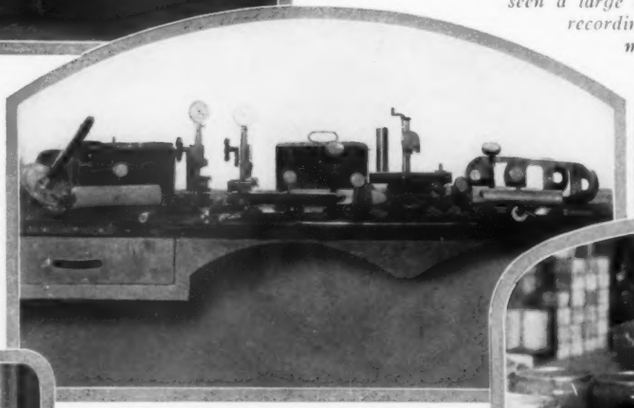


A FOUNDRY scene in the Maytag plant at Newton, Iowa. Notice the modern equipment used by the workmen who are preparing molds for clothes washer tubs. When the molds are completed they pass along on conveyors to the pouring section of the foundry

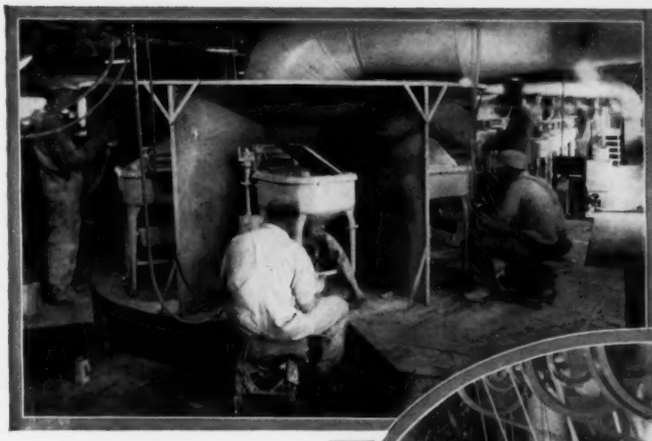
IN the view above may be seen a battery of milling machines turning out some of the smaller clothes washer parts. These are machines of the most modern type, equipped with tools and fixtures for quantity production. At the left is a row of single spindle drill presses. Notice the convenient arrangement of the conveyor for handling the small parts

ACCURACY is highly essential in the making of clothes washers, and for this reason the Maytag Company insists that each of the parts entering into the construction of the finished machine be carefully inspected. To do this requires the use of many very carefully made gages and inspection devices. Some of these are shown in the view at the left and below, while the workman directly below is engaged in inspecting and testing worm gears. This operation is highly important to insure long life for the gears and at the same time provide a quiet running machine. Among the equipment shown in the other illustration referred to here may be seen a large assortment of measuring and recording devices of all kinds that must be used to maintain the degree of accuracy demanded by the Maytag Company

ONE section of the machine department of the Maytag factory is shown above. Throughout the entire plant the machine tools are arranged in unit groups, according to the parts they are intended to produce. Materials here are transported by lift trucks



ONE of the several production assembly lines in the Maytag plant is seen at the left. It is on this line that the wringer is assembled on the clothes washers. The wringers travel overhead on an endless monorail carrier, while the washers move to the right on the power conveyor. Operators are placed at convenient stations where they remove the wringer from the overhead conveyor and attach it to the washer as it passes

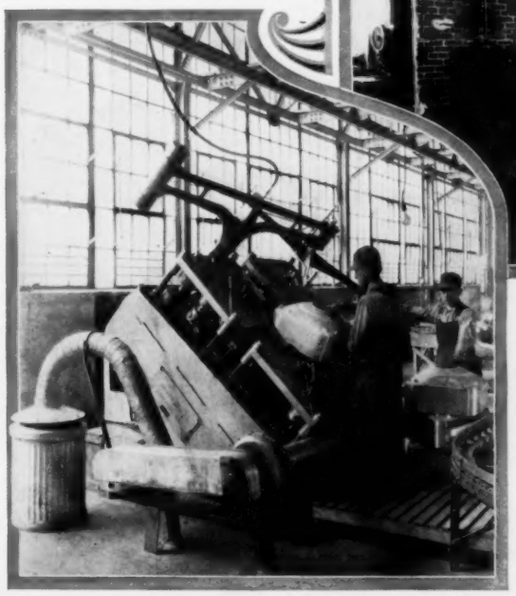


FINISHING is an important feature of clothes washer production, and the view above shows how this operation is performed in the Maytag plant. The illustration shows a revolving platform fitted with spray booths. This table is synchronized with the conveyor shown in the background at the right, which carries the finished machines from the assembly lines to the spray booths and then away again after they have been sprayed

THIS is a never-ending stream of clothes washer tubs as they pass from the foundry and cleaning departments on their way to the assembly line. At this point the tubs are removed from the conveyor and all rough surfaces are removed by grinding and polishing machines

IN the center of this page may be seen another group of single spindle drill presses as they are arranged for the production of small clothes washer parts. Notice that they too are served by roller conveyors, thus eliminating the manual handling of materials. At the right is another assembly conveyor, which shows how the washers move along on their own rollers, being propelled by a driving member attached to the conveyor that makes contact with the legs of the washers to push them forward. The washers are so spaced on the conveyor that the operators shown have ample time in which to perform their respective tasks while the machine is moving on to the next station in the line. In the center below is shown some of the heat treating equipment

THE view below shows how the molds pass from the foundry floor on conveyors to that point in the plant where the molten metal is poured into them. After this operation the molds are taken apart, the castings and sand are removed from the flasks



AS has been mentioned, much special equipment in the way of machines and tools is used in the manufacture of Maytag aluminum clothes washers. One of these machines is shown in the view at the left. It is a specially constructed drilling machine, so arranged that in one operation it drills 43 holes in the clothes washer tubs, one of which the workman is placing in the machine

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Testing Motor Drives with Electrical Instruments

No. 7 of a Series on Electrical Testing Instruments and Methods

An outline of the essential points in the measurement of power and the electrical connections required for each kind of power service

By D. H. BRAYMER
Consulting Engineering Editor
ELECTRICAL MANUFACTURING

IN THIS series of articles, practical details will be presented covering the tests that may be required to determine the following conditions: 1—Correct ratings of motors and control devices. 2—Causes of any unusual performance of motors. 3—Improper or inefficient applications of motors. 4—Reasons for trouble calls that come to service departments of the machine manufacturers when traced to the electrical drive.

In any motor application the source of electrical power comes up as the first point to consider and since the selection of instruments for a test and the connections to be made depend on the kind of electrical service employed it will be well to outline the essential points in the measurement of power and the electrical connections required for each kind of commercial power service, as follows: Direct current; Single-phase; Two-phase, four-wire and Three-phase power service.

Direct Current Service—In most cases direct current motors are operated from a two-wire service. There are, however, installations where direct current generators deliver service over three-wires, but in that case two wires are used for the motor connections, these being either of the outside wires and the middle wire or both outside wires, the voltage being the same between either outside wire and the middle one, but one-half the voltage between the two outside wires. For example, if the voltage is 115 between each outside wire and the middle one, then the voltage between the two outside wires would be 230. Power motors in the larger sizes in such a system are usually connected to the 230 volt supply wires and lights to the 115 volts supply. The commercial voltages for direct current motors are 115, 230, and 550 volts.

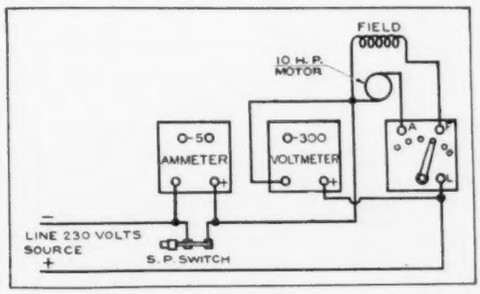

Figure 1
Connections of voltmeter and ammeter when making a load test on a direct current motor

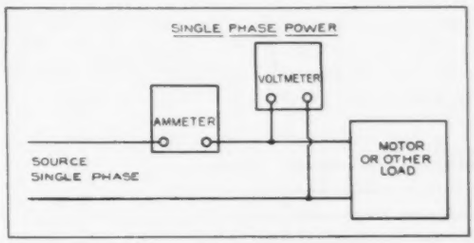

Figure 2
Diagram of connections for checking the power input to a single-phase motor when using a voltmeter and an ammeter. These connections are essentially the same as those shown in Figure 1 for a direct current motor

The power taken from a circuit by a direct current motor can be measured with an ammeter and a voltmeter. Power in watts then equals volts times amperes. The connections for these meters are shown in Figure 1. The horsepower load for a particular motor can then be determined from the following formula: Hp. = (volts $\times$ amps. $\times$ efficiency) $\div$ 746. For approximate calculations the motor efficiency can be obtained from Table I or from the motor manufacturer for the particular motor used. When using Table I, the percentage of load carried can be obtained by dividing the reading of the ammeter by the full load rating for the motor in amps. as marked on the motor nameplate. For example: If the motor tested is 3 hp. operated on 230 volts at 1150 r.p.m., the full load amps. from the name plate will be approximately 13 amps. In case the ammeter reading is 9.75 amps., then the load carried would be 3/4 and the efficiency from Table I would

be about 79 per cent. The horsepower represented by this load would then be:

Hp. = (9.75 × 230 × 0.79) ÷ 746 or 2.3.

For a more accurate output for the motor, a test should be made by the use of the Prony Brake on the motor pulley as described in the article on page 45 of the May issue of ELECTRICAL MANUFACTURING. The brake horsepower of a motor expressed in watts will never be equal

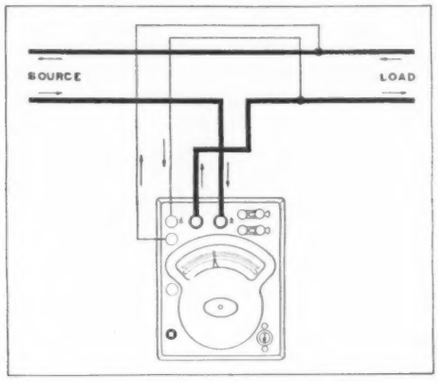

Figure 3

This diagram shows the connections for a single-phase wattmeter when used to measure the watts input to a single-phase motor

to the watts input taken from the line for the reason that some energy is consumed in the motor losses including bearing, windage and brush friction, and the electrical losses of the fields, armature and the magnetic losses of the iron construction. The watts output which is the brake horsepower computed from the horsepower delivered at the motor pulley divided by the watts input or the power taken from the circuit, represents the motor efficiency as a percentage but is used in formulas as a decimal. Thus 79 per cent motor efficiency would be used in the calculating formula as 0.79. In all horsepower calculations 746 watts is the figure used as equal to a horsepower.

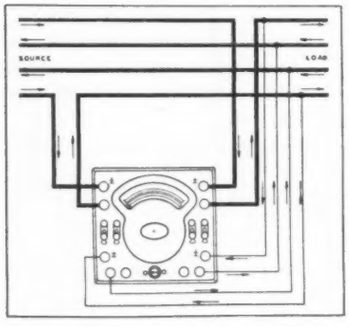

Figure 4

THESE are the connections for a polyphase wattmeter when used to measure watts input to a two-phase, four-wire motor

A. C. Single-Phase Service—Most small motors used on machines are single-phase for operation on either 110 or 220 volts. By small motors is meant those of the fractional horsepower rating. The power in watts taken by a single-phase motor can be obtained by a voltmeter and an ammeter with the connections as shown in Figure 2 or read directly by a single-phase wattmeter as shown in Figure 3. The reading from this wattmeter will be directly in watts. When the readings of a voltmeter and an ammeter are used it is necessary to know the power factor for use in the following formula: Volts × amps. × P.F. = watts. When the single phase wattmeter is not available, the approximate power factor can be obtained from Table II. The horsepower calculation is then the same as for the direct current motor using the formula: Hp. = (watts × efficiency) ÷ 746 or (volts × amps. × P.F. × Eff.) ÷ 746. In testing alternating current motors, the use of the wattmeter to obtain the watts input is the fastest and the most accurate method, using the connections of Figure 3 for single-phase service.

Two-Phase, Four-Wire Service—Such a service can be considered as two single-phase circuits and the power input to a motor is the power measured in one of these single-phase circuits multiplied by 2. This power input can be measured by an ammeter and a voltmeter connected into one phase and the following formula used: Watts = (Volts × amps. × P.F.) × 2. In this formula the (amps. × volts × P.F.) represents the watts input for one phase and then multiplied by 2 for the two phases. Horsepower output will then be, Hp. = (watts in both phases × Eff.) ÷ 746.

Again as in the case of single-phase power measurements the single phase wattmeter or a polyphase wattmeter is the most convenient instrument to use so as to read the watts

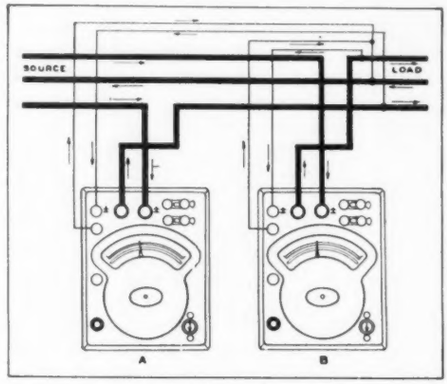

Figure 5

Two single-phase wattmeters connected as shown will measure the watts input to motors on any three-wire circuit, whether direct current, single-phase, two-phase or three-phase

direct from the instrument. When the single-phase wattmeter is used, two are required, one connected in each of the single-phase circuits. In case a polyphase wattmeter is used, it is connected as shown in Figure 4.

In measuring watts input for a two-phase, three-wire system, two single-phase wattmeters can be used as shown in Figure 5 and connected the same as used on a three-phase circuit or one polyphase wattmeter can be used connected as shown in Figure 6. The two-phase, three-wire circuit is

H. P.	R. P. M.		Load		
	Rated Full Load	No Load Approx.	½	¾	Full
2	850	945	72	75.5	76.5
3	1150	1240	75.5	79	80
3½	850	910	76	80	81.5
5	1800	1900	76	80	81.5
7½	1700	1770	79	83.5	86
10	1700	1770	80.5	84.5	86
15	1700	1755	82.5	85.5	87.5
20	1100	1135	86.5	88	89
25	1100	1140	85.8	87.3	89
30	1150	1180	86.5	88.5	90
40	775	815	88.1	89.9	90.5
50	750	790	89.1	90.5	91

Table 1

Approximate efficiency of shunt wound direct current motors for operation on 230 volts

not as often encountered as the two-phase, four-wire and it has no advantage over the latter except the saving in copper for the distribution system. The voltages in the two-phase, four-wire circuit are equal in each phase while the voltages in the two-phase, three-wire circuit are not equal. The voltages between the outside wires and the middle wire in this circuit are equal but the voltage across the two outside wires is the square root of two or 1.414 times the voltage across the outside and the middle wire.

A. C. Three-Phase Service—The chief advantages of the three-phase motor are that the size and cost of the motors are less and that the starting construction inside the motor and out is less complicated. The full load current carried per service wire for the same horsepower and voltage for a single-phase motor is about twice that for a three-phase motor. For the larger sizes of single-phase motors this requires a larger magnetic starter for instance than would be required for the same motor rating in a three-phase motor.

As already explained the formula for calculating the watts input for single, two or three-phase motors is the same when a wattmeter is used.

Hp. = (Watts input $\times$ Eff.) $\div$ 746.

It is possible, however, to measure the watts input to a three-phase motor with an ammeter and a voltmeter, but in that case the power factor must be known for use in the following formula:

Hp. = (Volts $\times$ amps. $\times$ 1.73 $\times$ P.F. $\times$ Eff.) $\div$ 746.

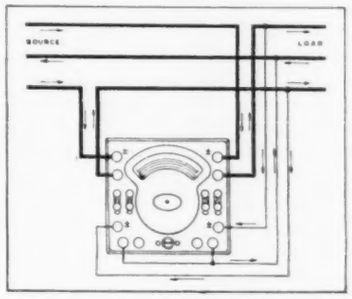

Figure 6

ONE polyphase wattmeter connected as shown can be used to measure the watts input to the following types of motors: direct current, single-phase, two and three-phase when three wires are used

The approximate power factor for 60 cycle motors can however be obtained from Table III when the ammeter and voltmeter are used.

The polyphase wattmeter is an essential instrument in three-phase calculations and when used is connected as shown in Figure 6 when small currents are to be measured and in Figure 7 when larger currents than 5 amps. are to be measured thus requiring the use of current transformers.

It is often necessary to know the starting current for a three-phase motor drawn from the line during the period of acceleration before coming up to full load speed. This value of starting current may vary from three to five times the normal running current as marked on the name plate of the motor and when measuring this starting current an ammeter must be selected with a scale range that takes into consideration this fact. Machines that start slowly and take up to one minute before reaching full speed require special starting apparatus and in this case the starting current in amps. and the exact length of time it takes the motor to reach full load speed and running current must be determined. The size and type of motor to use under these conditions is a point to consider and this subject will be taken up later in this series of articles.

H.P.	Speed, R. P. M.			Efficiency %				Power Factor %			
				Loads				Loads			
	Syn.	Full Load	No Load	1¼	1	¾	½	1¼	1	¾	½
½	1800	1730	1940	69	67	63	53	93	93	92	89
½	1200	1135	1330	65	65	60	52	81	80	78	72
¾	1800	1725	1925	66	64	58	48	87.5	87.5	86.5	84
¾	1200	1170	1350	....	63	60.05	50	....	78	73	67
1	1800	1710	1960	....	70	64	55	....	96	95	94
1	1200	1120	1230	67	66	61	51	82	80	78	71
1½	1800	1750	1950	75	73	68	63	97	97.5	97	94
2	1800	1730	1920	72	73	67	58	97	98	98	97
2	1200	1100	1220	69	69	65	60	89	90	88	80
3	1800	1700	1900	74	76	74	62	97	98	98	97
3	1200	1150	1290	75	74	70	61	94	95	95	94
5	1800	1700	1900	78	79	76	68	99	98	92	82
5	1200	1160	1270	80	79	77	70	97	98	98	97

Table 2

Efficiency and power factor for single-phase repulsion induction motors for operation on 110/220 volts, 60 cycle

H. P.	Syn. Speeds	Loads		
		½	¾	Full
2	1800	68	78	85
2	1200	58	71	78.5
3	1800	71	81	86
3	1200	67	78	83
5	1800	77	87	90
5	1200	72	80	85

Table 3

Approximate power factor of 60-cycle polyphase induction motors of the squirrel cage type in standard voltages of 220, 440 and 550

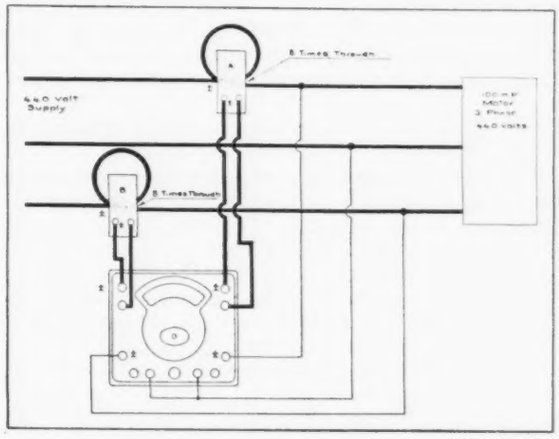

Figure 7

When currents to be measured with a polyphase wattmeter are larger than five amperes, current transformers are required connected as shown above

As already mentioned when measuring the watts input to a three-phase motor, two single-phase wattmeters are required connected as shown in Figure 5 or one polyphase wattmeter connected as shown in Figure 6. The polyphase wattmeter consists of two single-phase wattmeter elements mounted in one case and the reading on the scale is the algebraic sum of the indications of these two elements. The reading is correct when connected as in Figure 6 for a three-phase circuit either balanced or unbalanced and at any power factor. It is not necessary therefore to give consideration to power factor when this wattmeter is used in determining the watts input to a motor or in the calculation of the horsepower output when using the formula: Hp.= (Watts input $\times$ Eff.) $\div$ 746.

At times it may be desired to measure power factor accurately. Power factor may be determined by obtaining

(*Continued on page 66*)

Characteristics That Determine the *Selection* of MOTORS

No. 14 of a Series Discussing Motors of Different Types

In industry there are many applications for adjustable speed motors and their control apparatus some of which are described in the following

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AND

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IN previous installments of this series of articles various types of motors and control equipment were discussed in detail, as to characteristics, applications, performance and the like. The installment published in the May issue of ELECTRICAL MANUFACTURING had to do primarily with direct current motors while the installment published in June took up the subject of control apparatus and this discussion is continued in the following, with specific instances of the application of both motors and control equipment.

Figure 17 shows a group of large roll lathes with individual motor drive.

Screw machines, lathes, and milling machines employ an adjustable speed, shunt wound motor with field control. The rheostat may be set for a particular speed before the work is begun or the speed may be changed manually during the operation. There are a great number of different kinds of lathes but the shunt adjustable speed motor is practically always used. For some types of work it is desirable to have the reversing feature incorporated in the control.

A banding lathe such as used for winding banding wire on armatures of motors or generators is one example of a special lathe application. An adjustable speed motor with a non-reversing controller is supplied in this case.

A winding lathe used for winding wire on mandrels or for winding or forming armature coils for motors or other similar application may be operated by either a constant speed or an adjustable speed motor as desired.

Milling machines usually employ constant speed motors; but the adjustable speed motor may also be used, when a mill must take care of different classes of work.

Boring mills usually employ an adjustable speed motor with a non-reversing controller. One special application uses a reversing motor where only a small part of the circumference of the work is to be machined.

Figure 18 shows a reversing planer. The main drive for the planer is usually an adjustable speed reversing motor. Two rheostats are used, one for the cutting stroke, the other for the reversing stroke as the latter can usually be accomplished at a higher rate of speed.

Referring again to Figure 18, a complete picture of the assembly unit with the control features will be noticed. The automatic control panel is enclosed in the steel cabinet A. Two speed control rheostats are mounted on the inside of the cabinet door. The cutting speed is set by the rheostat handle B, the return stroke by the handle C. The stopping and reversing of the motor at the end of each stroke of the planer is controlled through the drum type master switch D. The drum is operated by the shifter rod E connected to the rocker F actuated by the dog G. The travel of the table in either direction is determined by the setting of the two dogs. The two upper buttons of the station H are used for ordinary starting and stopping. The two lower buttons

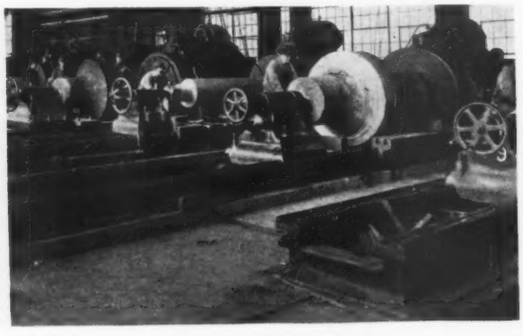


Figure 17

A group of large lathes with individual motor drives. Screw machines, lathes and milling machines usually employ an adjustable speed shunt wound motor with field control

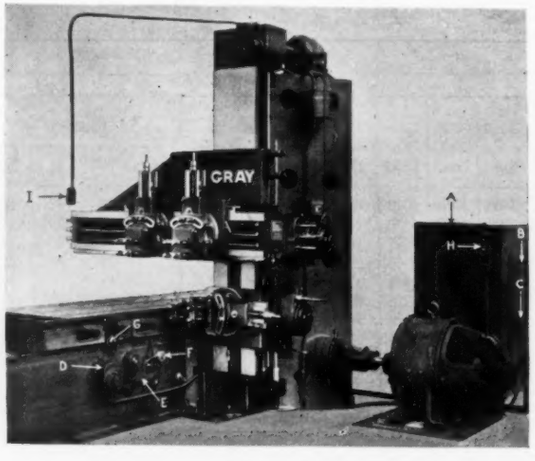


Figure 18

The main drive for such a reversing planer as this is usually an adjustable speed reversing motor. Two rheostats are used, one for the cutting stroke and the other for reversing

serve as a transfer station for changing the control from the drum master switch D to the pendent setting up switch I. This latter switch is used only in setting up work.

The control arrangement for this planer is a very good example of the development of control apparatus for machine tool service, providing the utmost in convenience and efficiency of machine operation.

Figure 19 shows a special press used for making automobile radiators driven by an adjustable speed armature shifting motor. The speed adjustment is obtained manually by shifting the armature by means of the hand wheel that can be seen over the back edge of the motor frame.

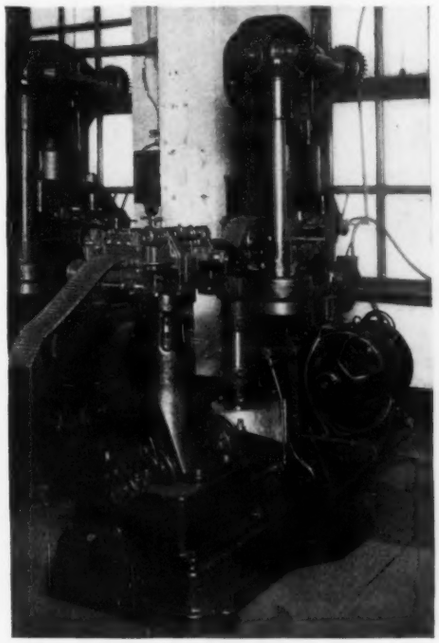


Figure 19

A special press for making automobile radiators driven by an adjustable speed armature shifting motor. Speed adjustment is obtained manually by shifting the armature

Compound wound motors, as mentioned before, are used for punch presses, shears, etc. In practically all cases of this kind a flywheel is used in connection with the compound wound motor. The rate at which power is required in applications of this nature is very irregular. In the case of the punch press hardly any power is required until the die comes in contact with the metal to be punched. The flywheel is used to smooth out the peaks of the load, giving up energy as the motor slows down under the sudden impact of the heavy load and absorbing energy when the motor speeds up again. A compound wound motor is used for this application because of its inherent tendency to exert a larger torque with a smaller current than the shunt machine, and it has the advantage of more torque for quick acceleration.

The preceding examples are typical of machine tool service in general. The main features as outlined are adaptable to practically all types of machine tools. The table above shows the motors that should be applied to various types of machine tools. The sign "X" in the table indicates the type of motor and the percentages show the compounding usually required when compound motors are used.

Motors for Machine Tools*

Tools	Direct Shunt	Current Comp.	Motors Series
Bolt Cutter	×		
Bolt and Rivet Header		20% 40%	
Bulldozers		20% 40%	
Boring Machines	×		
Boring Mills	×		
Raising and Lowering Cross Rails on Boring Mills and Planers		40%	×
Boring Bars	×		
Bending Machines		20% 40%	
Bending Rolls		40% 80%	
Corrugation Rolls		20% 40%	
Centering Machines	×		
Chucking Machines	×		
Boring, Milling and Drilling Machines	×		
Drill, Radial	×		
Drill, Press	×		
Grinder-Tool, etc.	×		
Grinder-Castings		20%	
Gear-Cutters		20%	
Hammers-Drop		20% 30%	
Keyseater Milling Broach	×	20%	
Keyseater Reciprocating Lathes	×		
Lathe Carriages			×
Milling Machines	×		
Heavy Slab Milling	×	20%	
Pipe Cutters	×		
Punch Presses		20% 40%	
Planers		20%	
Planers-Rotary	×	20%	
Saw—Small Circular	×		
Saw—Cold Bar and I-Beam		20%	
Saw—Hot		20%	
Screw Machine	×		
Shapers		20%	
Shears		20% 40%	
Slotters		20%	
Swaging		20%	
Tappers	×		
Tumbling Barrels or Mills		20%	

* This table taken from "Direct Current Motors and Generator Troubles" by T. S. Gandy and E. C. Schacht.

× indicates whether shunt or series type motors should be applied, and the percentages given under compound motors signify the amount of compounding used for various machine tool drives, when compound motors are used.

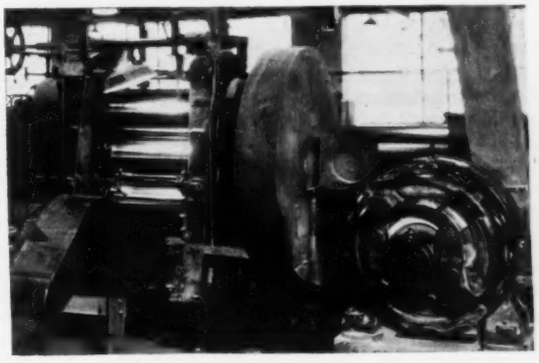


Figure 20

An adjustable speed, shunt wound direct current motor driving a rubber calendar. On top of the calendar frame at the right of the rolls may be seen an emergency tripping switch

Rubber Calenders, Paper Calenders, Printing Presses, Cloth Printing machines, etc.—Machines of this type require at starting (for threading material between rolls, etc.) a speed much lower than the normal operating speed. The load is usually of a friction nature requiring a constant motor torque.

A wide range of speed is required usually at least at 4 to 1 ratio. This may be obtained by an adjustable speed motor

with field control, an adjustable speed motor with armature shifting, or by the use of a two voltage system. The latter reduces the amount of field adjustment necessary hence lowering first cost of motor, but a third power wire is required and more complicated generating equipment. Either of the methods is satisfactory. The relative cost will depend

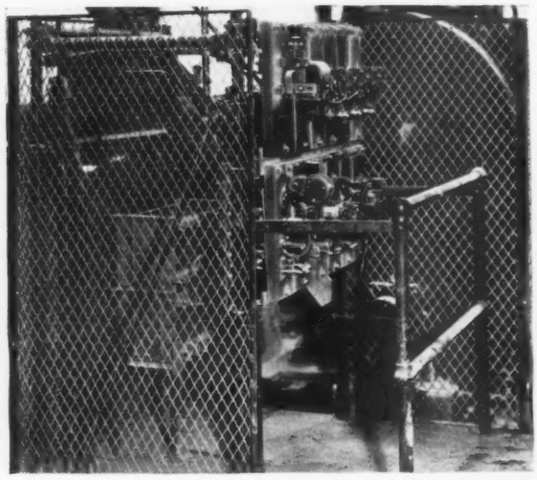


Figure 21

The control panel and contactors for starting the motor shown in Figure 20 with the contactors for throwing the motor on dynamic braking for quick stopping

on the size of the units, and is a matter for investigation in a particular case.

Figure 20 shows an adjustable speed, shunt wound direct current motor driving a rubber calender. The motor drives the rolls through reduction gears. Mounted on the top of the calender frame on the right side of the rolls can be seen an emergency tripping switch. On either side of the rolls a steel cable comes down from a lever arrangement attached to the emergency switch. This cable is secured at the bottom so that it is always at hand for convenient use. If anything goes wrong with the machine or the operator gets caught in the rolls, the tripping of the emergency switch cuts the motor from the line and stops it almost immediately through dynamic braking. A safety device of this nature is required in practically every installation.

Figure 21 shows the control panel with contactors for starting the motor shown in Figure 20, also contactors for throwing the motor on dynamic braking. The dynamic braking resistor can be seen directly back of the panel. Note the pipe railing and wire screening used to protect passing workmen against contact with live parts of the control circuit. The control shown is typical of the rubber calender motor application.

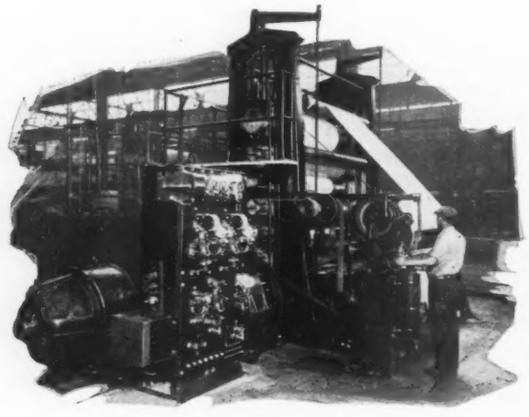


Figure 22

A 150-hp., 230-volt adjustable speed motor driving an 80-in. calender for coated paper at speeds of 50 to 1000 feet per minute. The controller in this case is automatic

Figure 22 shows a 150 hp., 230 volt adjustable speed motor driving an 80-in. calender for coated paper at speeds of 50 to 1000 feet a minute. The controller is automatic, giving slow speed for threading-in, time limit acceleration in starting and graduated dynamic braking for quick stopping. In addition to speed control points, the drum controller has Start, Stop, Slow, Fast and Safe positions. The drive is direct through herringbone gears, eliminating all clutches and belts on the main drive. The control equipment is mounted on a panel directly adjacent to the calender, providing convenience for adjustments or repairs as necessary. The drum type controller is mounted in full view of the calender rolls so that any trouble developing or any speed adjustments necessary can be immediately taken care of by the operator.

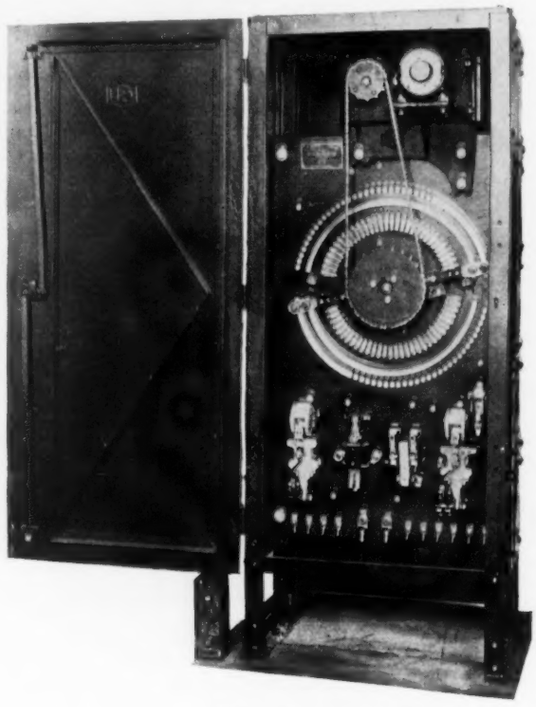


Figure 23

A variable voltage automatic controller for controlling an adjustable speed motor driving a paper combining machine. The control apparatus is enclosed in a steel case

Formerly calenders were driven through belt drives. Installations using adjustable speed motors and automatic control proved a great boon to the industry. The output has been increased because of a greater range of calendering speeds and greater ease of control. The slower running speeds have contributed to this as well as the higher speeds. With these slower speeds available, poor rolls of paper are run with a better overall efficiency, and fewer breakages. Quality of paper has been improved by having the right speed for each grade of paper. Maintenance has been lessened by eliminating belts and clutches.

The calender drive shown in Figure 22 was originally a belt drive. When changed over to motor drive, a big increase in production was realized. The contributing factors were, of course, the increased speed range, fewer breaks in paper and greater ease of control.

Industrial Control Standards

These standards for industrial control apparatus include American Standards, Nema Adopted Standards, Recommended Practices and Suggested Standards for Future Design. The use of them results in greater uniformity and in improved quality of industrial control equipment

THE following article is the fourth in a series presenting the Industrial Control Standards of the National Electrical Manufacturers Association. This series forms a reference work of practical information concerning the manufacture, test and performance of industrial control equipment

Non-Corrodible Material

120-606 (a) Iron, steel or other material with a suitable protective coating, shall be considered non-corrodible material.

Recommended Practice 5-23-1919.

D. C. Manual Starting Rheostats

120-607 (a) Standard starting rheostats shall be capable of opening the circuit on the first point with the motor at rest.

(b) Standard 500-volt face plate type direct current manual starting rheostats may be furnished for a maximum of 600 volts.

Adopted Standard 11-17-1920.

Three Pole Primary Contactor Connections

120-608 (a) It is recommended that three pole primary contactors should be so connected that the two overload elements are in the leads of the motor terminals, T-1 and T-2.

(b) When this contactor is used on a 2-phase, 3-wire circuit, L-3 should be made the common power line, and terminals T-3 and T-4 should be connected together at the motor for the common lead to the motor from the terminal T-3 on the panel. When used on a 2-phase, 4-wire circuit, line L-4 should be run direct to terminal T-4 at the motor.

Recommended Practice 3-30-1928.

Size of Leads for Wound Secondary Motor

120-609 (a) The connecting wires between the secondary of a wound secondary motor and its resistor shall not be less than the percentages of continuous rating given in the following table:

Duty	Per Cent of Continuous Rating
15 sec. out of 4 min. (light starting)	35
30 sec. out of 4 min. (heavy starting)	45
45 sec. out of 4 min. (extra heavy starting)	55
1 min. out of 4 min. (light intermittent)	65
1½ min. out of 4 min. (medium intermittent)	75
2 min. out of 4 min. (heavy intermittent)	85
Continuous	110

NOTE—See Table I, Section 120-516 for service classification of resistors.

Adopted Standard 10-24-1927.

Standards Index for This Page

120-606 Non-Corrodible Material
120-607 D.C. Manual Starting Rheostats
120-608 Three Pole Primary Contactor Connections
120-609 Size of Leads for Wound Secondary Motor
120-610 Speed Reduction
120-701 Enclosures for Controllers
120-702 Design of Enclosures for Controllers

Speed Reduction

120-610 (a) Speed reduction of motors as accomplished by control apparatus will be expressed in percentage of full load speed.

Adopted Standard 10-29-1928.

Enclosures for Controllers

120-701 (a) Enclosures are furnished with, and form a part of industrial control equipment for the purpose of affording protection by construction. These enclosures are of the following general classes:

Class I—A solid enclosure without slot or other opening.

Class II—A solid enclosure except for a slot for the operating handle or openings for ventilation, or both.

Class III—Wire mesh, perforated screens or grill work.

120-702 (a) DESIGN.

(1) All enclosures shall be so designed and assembled that they will withstand handling during shipment and installation.

(2) There must be sufficient space within the enclosure to permit uninsulated parts of wire terminals to be separated so as to prevent their coming in contact with each other. Enclosures must be such as to permit proper wire connections to be made with adequate spacing of the terminals and ends of conductors from adjacent points of the enclosures.

(3) Exposed non-arcing current-carrying parts within the enclosures shall have an air space between them and the uninsulated part of the enclosure of at least ½ in. for 600 volts or less. Enclosures of sizes, material or form not securing adequate rigidity must have greater spacing.

(4) All enclosures and parts of enclosures such as doors, covers, tanks, etc., must be provided with means for firmly securing them in place. Among the available means are locks, interlocks, screws and seals.

(5) Where the walls of the enclosure are not protected by barriers or by a lining of non-combustible insulating material the arc-rupturing parts of the controller shall have air spaces, as per Table III, between them and the walls of the enclosure unless a test on any specific device demonstrates that

Table III—Clearances Between Are Rupturing Parts and Enclosure

Hp. Rating	Distance from Contacts in Direction of Blowout in Inches D. C. and A. C. 300 V.	600 V.	Vertical Distance above Contacts without Blowout in Inches D. C. 300 V.	600 V.	A. C. 300 V.	600 V.	Horizontal Distance from Contacts and Distance below Contacts in Inches D. C. and A. C. 300 V.	600 V.
5	1¾	3	4	Barriers	1¾	3	¾	1½
10	2	4	5	Barriers	2	4	¾	1½
50	3	5	6	Barriers	3	5	1	2
100	4	Barriers	Barriers	Barriers	4	Barriers	2	3
Above 100	Barriers	Barriers	Barriers	Barriers	Barriers	Barriers	Barriers	Barriers

NOTE I—All distances shall be measured from the contact tips or arc horns.

a smaller space is safe for that particular device.

120-703 (a) MATERIAL.

(1) MATERIAL. In the following paragraphs it is assumed that steel (or gray iron for castings) will be the metal employed. Copper, bronze and brass are sometimes used, in which case the requirements given for steel shall be complied with.

(2) THICKNESS OF CASTINGS. Cast metal for enclosures, whether of iron or other metal, shall be at least ⅛ in. thick at every point and should be of greater thickness at tapped holes for conduit, at reinforcing ribs and at door edges.

(3) SHEET METAL THICKNESS. The minimum thickness required for sheet-metal construction varies with the size of the device. For Class I and II the enclosures of sheet metal shall be of a gauge not less than that given in Table IV.

(4) All Class III enclosures shall be provided with a supporting frame.

(5) Wire screening used for enclosures must conform to the requirements in Table V.

Table V—Requirements of Wire Screens

Maximum Openings in Screen	Minimum Wire Size American Steel Wire Gauge
½ in.	No. 16
Over ½ in. and not over 2 in.	No. 12

(6) Where the opening is over ½ in. the enclosure must not be less than 4 in. from any live part.

(7) The requirements of enclosures for floor-mounted controllers for voltages not in excess of 750 volts shall be:

(I) Where the surrounding enclosure is 6 ft. or more in height and exposed live parts are not less than 6 in. below the upper edge, no covering is required across the top of the enclosure.

***Exceptions**—Where cranes or other movable apparatus or operations of a special character may introduce possible hazards from above, overhead enclosures may be required.*

(II) Where the surrounding enclosure is within 6 in. of the floor and exposed live parts are not less than 6 in. above the lower edge, no covering will be required for the bottom.

Recommended Practice 6-7-1921.

Insulation Clearances

120-704 (a) The distances between non-arcing, uninsulated live parts of control equipment to ground or to non-arcing uninsulated live parts of opposite polarity shall be not less than the values given in Table VI.

Type Standarization

Manual Starters

120-711 (a) Standard manual starters of the face plate type shall be enclosed.

Recommended Practice 8-5-1925.

Manual Speed Regulators

120-712 (a) Standard speed regulators of the face plate type shall have enclosed face plates.

Recommended Practice 8-5-1925.

Standards Index for This Page

120-703 Enclosure Control Material
120-704 Insulation Clearances Type Standardization
120-711 Manual Starters
120-712 Manual Speed Regulators
120-713 Automatic Starters
120-714 Overload Devices
120-715 Control Circuit Fuses
120-716 Voltage Ratings, D.C. and A.C.
120-717 Mounting of Disconnect Switches on General Purpose Control
120-718 Starters for Wound Secondary Induction Motors
120-719 Manual Starters for D.C. Motors

Table VI—Clearance Between Uninsulated Non-Arcing Parts and to Ground

Maximum Voltage	Minimum Clearance Distance in Inches: Through Air	Through Oil	Across Clean Dry Surfaces Air	Across Clean Dry Surfaces Oil
300 (and over 50)	¼	¼	⅜	⅜
600	⅜	⅜	½	½
2500	1	¾	2	1
7000	2	1½	3½	2

NOTE I—These clearance distances should be increased for dirty or moist conditions.

Recommended Practice 6-7-1921.

Automatic Starters

120-713 (a) Standard automatic starters of 10 hp. or less shall be enclosed.

(b) Standard direct current, automatic starters above 10 hp. shall have overload relays.

Recommended Practice 8-5-1925.

Overload Devices

120-714 (a) Standard overload devices, which de-energize magnets, shall open the circuit of such magnets.

Recommended Practice 8-5-1925.

Control Circuit Fuses

120-715 (a) Control circuit fuses are not included as part of standard general purpose controllers of 600 volts or less.

Recommended Practice 8-5-1925.

Voltage Ratings, D. C. and A. C.

120-716 (a) Standard voltage ratings for direct current control shall be:

(1) 115 volts up to a maximum of 100 hp. for constant speed motors.

(2) 115 volts up to a maximum of 25 hp. for adjustable speed motors.

(3) 230 volts for all ratings.

(b) Standard voltage ratings for alternating current controllers shall be in accordance with Table VII and Table VIII.

Table VII

Volts	Cycles	Phase	Ratings
110	60	2 and 3	5 hp. Max.
220	60	2 and 3	All
440	60	2 and 3	All
550	60	2 and 3	All
2200	60	2 and 3	All

Table VIII

Volts	Cycles	Phase	Ratings
220	25	3	All
440	25	3	All
550	25	3	All
2200	25	3	All

Recommended Practice 8-5-1925.

Mounting of Disconnect Switches on General Purpose Control

120-717 (a) Inasmuch as disconnect switches are considered as unit pieces of apparatus and usually mounted separately from the control, it is recommended that as a type standard such disconnect means be not mounted within the controller enclosure.

Exception to this is recognized in the combination of A. C. magnetic across-the-line starting switches and disconnect means.

Recommended Practice 10-25-1927.

120-718 (a) Starters for wound secondary induction motors of 15 hp. or less will have one step of starting resistance.

Recommended Practice 10-24-1927.

Manual Starters for D. C. Motors

120-719 (a) RESISTOR CLASSIFICATION.

(1) 50 hp. and below—No. 14 or No. 15, Rule 120-517.

(2) Above 50 hp.—No. 32, No. 33, No. 34 or No. 35, Rule 120-517.

Recommended Practice 5-23-1919.

Table IV—Minimum Thickness of Steel Metal Enclosures

Maximum Volume of Enclosure Cu. Ft.	Maximum Area of Any Surface Sq. In.	Maximum Dimension Inches	Without Supporting Frame. Minimum U. S. Sheet Steel Gauge	With Supporting Frame or Equivalent Reinforcement. Minimum U. S. Sheet Steel Gauge
¾	..	12	20 (.037)	24 (.025)
1	..	18	18 (.050)	20 (.037)
..	360	24	16 (.062)	18 (.050)
.	1200	48	14 (.078)	16 (.062)
..	Over 1200	..	10 (.141)	16 (.062)

Automatic Starters for D. C. Motors

120-720 (a) Resistor Classifications.
(1) No. 35 or No. 36, Rule 120-517.
Recommended Practice 5-23-1919.

Manual Starters for Wound Secondary Induction Motors

120-721 (a) Resistor Classification.
(1) 50 hp. and below—No. 14 or No. 15, Rule 120-517.
(2) Above 50 hp.—No. 32, No. 33, No. 34 or No. 35, Rule 120-517.
Recommended Practice 5-23-1919.

Automatic Starters for Wound Secondary Induction Motors

120-722 (a) Resistor Classification.
(1) No. 35 or No. 36, Rule 120-517.
Recommended Practice 5-23-1919.

120-750 Graphic Symbols for Use on Diagrams (see *Chart*).
Recommended Practice 11-2-1922.
Effective 1-1-1923.
Recommended Practice 11-2-1922.
Effective 1-1-1923.
Recommended Practice 10-22-1925.
Recommended Practice 11-2-1922.
Effective 1-1-1923.
Recommended Practice 4-23-1925.

Abbreviations

120-751 Abbreviations

Standard abbreviations shall be:

1. Power Apparatus.

Armature .....Arm.
Field (descriptive).....Fld.
Field (used alone).....Field
Frequency Changer.....Freq. Ch.
Generator .....Gen.
Motor .....Mot.
Motor-Generator Set.....M. G. Set
Synchronous Condenser..Syn. Cndsr.
Synchronous Converter....Syn. Conv.
Transformer .....Trans.

Standards Index for This Page

120-720 Automatic Starters for D.C. Motors
120-721 Manual Starters for Wound Secondary Induction Motors
120-722 Automatic Starters for Wound Secondary Induction Motors
120-750 Graphic Symbols for Use on Diagrams
120-751 Abbreviations

2. Switchboard Control and Switching Equipment.

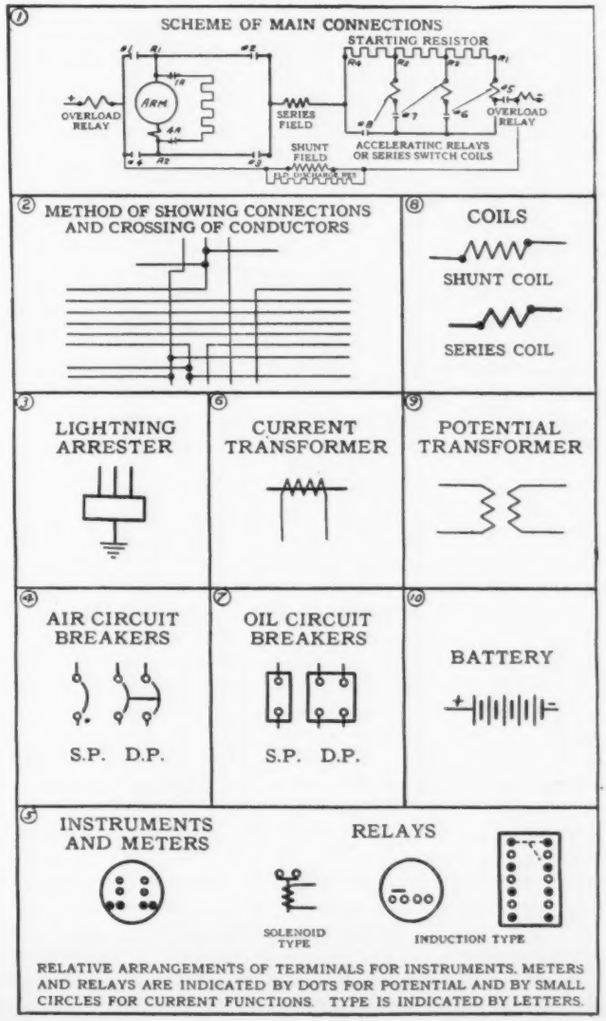
Ammeter .....Am.
Ammeter Switch.....Am. Sw.
Bell Alarm Switch.....B. A. Sw.
Black Enamel Slate.....B. E. S.
Blue Vermont Marble.....B. V. M.
Brake .....Br.
Bushing Transformer...Bush. Trans.
Choke Coil.....Ch. Coil
Circuit Breaker.....Cir. Bkr.
Compensator .....Comp.
Condenser .....Cndsr.
Constant Current Transformer.....
.....C. Cur. Trans.
Control Switch.....Cont. Sw.
Current Transformer.....Cur. Trans.
Demand Indicator.....Dem. Ind.
Demand Meter.....Dem. Met.
Electrostatic Ground Detector.....
.....Elec. Gd. Det.
Equalizer .....Eq.
Framework .....Fmwk.
Frequency Indicator.....Freq. Ind.
Frequency Meter.....Freq. Met.
Fuse .....Fuse
Fusible Cutout.....Fsbl. Cut.
Ground Detector.....Gd. Det.
Insulation or Insulating.....Ins.
Insulator .....Ins.
Lamp .....Lamp
Lightning Arrestor.....Lgt. Arr.
Marine Finish Slate.....M. F. S.
Mechanism .....Mech.
Meter .....Met.
Natural Black Slate.....N. B. S.
Panel .....Pnl.
Potential Plug.....Pot. Plug
Potential Receptacle.....Pot. Rec.
Potential Transformers...Pot. Trans.
Power Factor Indicator....P. F. Ind.
Power Factor Meter.....P. F. Met.
Pull Button Switch.....Pull B. Sw.
Push Button.....P. B. or Push B.
Push Button Switch.....Push B. Sw.
Reactive Factor Meter....R. F. Met.
Reactive Volt-ampere Indicator....
.....R. V. A. Ind.
Reactive Volt-ampere Meter.....
.....R. V. A. Met.
Reactive Voltmeter.....R. Vm.
Reactor or Reactance.....React.
Regulator .....Reg.
Relay .....Rel.
Resistor .....Res.
Rheostat .....Rheo.
Starting Switch.....Stg. Sw.
Support .....Sup.
Swinging Bracket.....Swg. Bkt.
Switch .....Sw.
Synchronism Indicator.....Syn. Ind.
Synchronizing Plug.....Syn. Plug
Synchronizing Receptacle...Syn. Rec.
Synchronizing Switch.....Syn. Sw.
Synchroscope or Synchronoscope..
..... Syn.
Temperature Indicator....Temp. Ind.
Terminal .....Term.
Tripping Transformer...Trip. Trans.
Voltage Detector.....Volt. Det.
Voltage Plug.....Volt. Plug
Voltage Receptacle.....Volt. Rec.
Voltage Switch.....Volt. Sw.
Voltage Transformer....Volt. Trans.
Voltmeter .....Vm.
Watt-hour Meter.....W. H. M.
Wattmeter, Indicating.....Wm.
Wattmeter, Integrating.....Whm.

3. Descriptive Terms

Air .....Air
Alternating Current.....A. C.
Automatic .....Auto.
Automatic Reclosing.....Auto. Recl.
Auxiliary .....Aux.

(To be continued)

Graphic Symbols for Use on Diagrams



Editorials

Elimination of Electrical Misfits on Motor Driven Machines

WHEN an electric motor is applied to a machine as the driving force, it is regarded by the average operator as an integral part of the machine and capable of operating it at the output recommended by the machine maker or expected of it. In many instances, however, a motor driven machine is purchased for a particular operation but later used on a modification of that operation. So long as the machine performs on its changed duty nothing is heard from it. On the other hand, should this machine fail to perform as expected on its new work, the manufacturer is very promptly notified in the form of a complaint of disappointment or of dissatisfaction. Such complaints to be properly handled by the manufacturer call for some performance history of the operation of the unit and full details of its present performance and work being done. The service files of correspondence in the engineering departments of manufacturers will usually disclose that a complete analysis of machine performance in the case of a complaint of this nature on the part of a user is most unusual and that it requires several letters containing suggestions on what might be done or requests for added information in order to make such suggestions. In the end it is probable in the case of a good customer, that a representative from the factory or from a nearby branch office is instructed to go to the location of the machine and determine just what may be wrong.

When this action is required or considered advisable owing to the tenor of the correspondence, and a representative is dispatched with the file of correspondence on the subject, it usually requires studied diplomacy or considerable experience in design and operation, or both, to leave the plant (in the case of serious trouble) with all parties satisfied. When it is necessary to leave the location of the machine simply with an accumulation of information secured or surmises on the cause of the failure of the machine to perform as expected, the problem then comes back to the engineering department for the best possible guess on the course of action.

Should this trouble appear to be in the electrical end of the mechanism, the course of action easiest to take is to refer the entire complaint to the maker of the electrical apparatus and notify the user and customer that such action has been taken. Then a second call will no doubt be required by a representative of the maker of the electrical equipment furnished for the particular machine. If the trouble is purely electrical, he will handle it as required; but should the direct cause be mechanical or faulty design of the machine mechanism, then the heads of two engineering departments are likely to be locked in volumes of correspondence containing technical alibis or buck-passing tactics. What ever the result, someone, in some way, must find a method of absorbing the expense of getting to the end of the difficulty and its best solution. Perhaps the same trouble and expense will not be repeated but the point of greatest interest is that it can and should be avoided before a machine is allowed to leave a shipping floor.

ELECTRICAL MANUFACTURING is providing through its editorial columns one effective means for reducing the service cost on electrical equipment by furnishing to the machine builder practical information that will eliminate the possibility of electrical misfits in the design and construction of machines. Mechanical men are forced by the trend of the demand for all electrical operation on machines to become just as familiar with motor applications and their control as they have been in the past in the correct application of gears and belts. Those of our readers who have made practical application of the series of articles on "Characteristics That Determine the Selection of Motors," and the one on "Measuring Instruments and Methods," have no doubt expressed to themselves a silent desire for some additional information or supplementary data on some point that has been discussed.

The editors of this publication earnestly ask that these silent desires for specific information be presented to them in letters so that it will be possible to inject into these series of articles or any others the information of greatest practical value. This kind of cooperation between readers of this publication and its editors is a fundamental element of the editorial policy of ELECTRICAL MANUFACTURING. To those who do not now know that we stand ready to deliver this kind of special service, a special invitation is extended to try it out. If we cannot get the information desired quickly, this will never be offered as an alibi, for we will work on it until it is available. Every request for information will be handled in a way that will get for you the information desired, either in a letter or by presentation as an article.

Tell us your problems and we feel sure that you will be surprised at what we mean by editorial service and will be well paid for your part in this kind of cooperation wherein you help our editors to help you in the securing of some specific information dealing with the application of electrical equipment on machines or the analysis of mechanical problems wherein the construction or performance of electrical equipment is involved.

Shipping Containers

IT is generally conceded that a large part of the loss and damage now being experienced in the shipment of merchandise in containers of all kinds can be directly attributed to the method of packing and the type of container employed. It is well, then, for shippers to consider carefully every element that enters into the transportation of merchandise, from the time it leaves the factory until it is placed in the hands of the ultimate consumer.

A sturdy, well-made container, no matter what the type, is in reality a good form of business insurance. Few commodities cost less to produce than the containers in which they are shipped, and most of them cost many times more; hence the use of types of containers and methods of packing that will insure safe delivery is good economy.

In these days of quantity marketing, when millions of dollars are being spent annually in gaining the user's confidence in the merchandise offered, and in building dealer and consumer good will, the condition of the goods when they reach the buyer is vitally important to all concerned.

At least some part of the vast sums lost annually, due

to the use of containers incorrectly designed or improperly constructed, could be saved if shippers would carefully consider packing methods and correct container construction.

The type, size, shape, or weight of the commodity to be shipped usually determines the type and construction of the container to be employed, and the design and construction of each of the many different types of containers now in general use have their own inherent problems. Therefore, to assure that his products will reach the consumer in good condition, and to aid in reducing the millions of dollars paid annually for loss and damage, more careful attention should be given by the shipper to the fundamentals of good container design and construction. Manufacturers of shipping containers employ package engineers whose duties are to assist shippers of merchandise in the selection of the proper type, design and construction of the container best suited for shipping their products.

Exhibits at Conventions

SINCE the earliest meetings that are now called trade association conventions there have been exhibits in one form or another. At first, of course, the number of these exhibits was small, as was the attendance. As more and more interest was aroused in conventions and as attendance began to increase, in the same manner did the number of exhibitors become greater.

At first the displays were simple, requiring little floor space, and their chief aim was merely to show merchandise or products. Gradually, however, this simple form was discontinued until at the present time, at some of the larger conventions, floor space as great as that at Madison Square Garden, the Chicago Coliseum or the Atlantic City auditorium will scarcely meet the requirements. Not only that, but the exhibits have become highly ornate and elaborate, rivaling each other in artistic and decorative effects; all of which is of tremendous expense to the exhibitor.

Of course, there is good advertising value in exhibits at well attended conventions. But is this value worth the cost? Moreover, is there sufficient development in the period of a year in any one class, type or kind of general products or merchandise of any one industry to warrant the expense of an exhibit at every annual convention?

Past experience shows that in general there is not. For this reason, and because of the cost involved to the exhibitor, several of the larger organizations that have held conventions annually for years, and are still doing so, have decided that one exhibit every second year is all that is warranted. They say this practice aids them in their association work. No time is spent in visiting exhibits and because of this more can be accomplished in shorter time. Moreover, they realize the expense of these displays, all of which must be paid by the exhibitors, and they feel it is not justified.

Lowering Production Costs

COMPETITION has been said to be the life of trade. But, if a manufacturer hopes to attain success in competition he must first place his product on a competitive basis with those of other manufacturers of like or similar merchandise.

In this respect much has been said relative to the high cost of distribution and the excessive expense incident to ever-changing marketing conditions. Likewise, the cost of production has been discussed extensively, yet it would still appear that some manufacturers have apparently failed to appreciate the many advantages to be had from the full use of modern production equipment and methods.

Machine tools, properly operated; carefully planned production schedules; well designed products; and materials-handling equipment are four of the fundamentals for lowering production costs.

Many manufacturing plants today are fitted with the best that can be afforded in the way of machine tool equipment. Production schedules have been carefully planned in accordance with the limitations of existing manufacturing facilities. Most products have been designed to be made at low cost and to render full service, in so far as the limitations of manufacturing facilities will permit the making of such a product. Yet there are many manufacturers who have failed to appreciate how more intensive use of modern materials-handling equipment might make possible a better arrangement of machine tool equipment, a change in production schedules and even a change in design of product that would permit of lower production costs which would make possible the placing of the product on a better competitive basis.

Selecting Motors and Control Equipment for Motor Driven Machines

MANY of the manufacturers of motor driven machines and appliances send their machines into the field and leave the problem of selecting motors and control for them entirely up to the customer. The problem of selecting motors and control for these machines is entirely too important and has too great a bearing on the operation of the machine and the satisfaction of the customer with that machine to allow such a condition to exist. Failure by the customer to select the proper motor and control equipment may cause an otherwise good machine to fail in service. Not because the machine is faulty but because the control equipment and the motor are not meant for that particular application.

The control equipment, the motor driving the machine and the machine itself are too intimately tied together to risk the proper functioning of the whole installation by leaving the selection of the motor and control to a hit-or-miss choice. This is being realized more and more by machine manufacturers who have foreseen that they cannot afford to risk their reputations as good machine manufacturers by allowing the customer to select motors and control to suit himself. This holds good for both domestic and foreign sales of machines, except that in the case of foreign sales the danger of improper selection is much greater.

In the section of the series "Characteristics Determining the Selection of Motors," published this month in ELECTRICAL MANUFACTURING, several instances of complicated motor and control installations on motor driven machines are discussed. These examples of the proper selection of motors and control serve to make more clear the importance of this problem to the machinery manufacturer. It is difficult to understand why the makers of motor driven machines have let this problem go unsolved as long as they have. Possibly it is because many of them do not have men in their organizations who have sufficient training along these lines to select motors and control equipment. If this is true, there is still no excuse for it because each motor or control manufacturer maintains such a staff of engineers to help all of his customers. If, on the other hand, they have not realized the importance of this problem, the examples of successful control and motor applications cited in the article previously mentioned should convince them finally and cause each manufacturer to give this problem the consideration it deserves in the design of his machines.

Courtesy, Structural Slate Co.
Pennsylvania, Vermont and Maine are the principal slate producing States, and only a small part of this is suitable for electrical uses. Above, looking down into an 800-foot slate mine

SLATE and Its Electrical Uses

No. 16 of a Series on Common Materials

Slate lends itself to decorative treatment and combines with this the utilitarian property of furnishing safety in connection with electrical wiring for light, heat and power

By WILLIAM CRAWFORD HIRSCH

THE usefulness of slate as a mounting base for meters, switches, and other current-control devices was recognized many years ago by electrical manufacturers, and this rock product has steadily fortified its position as one of the electrical industry's important insulating materials. There has been nothing spectacular about the development of slate's electrical uses, production as well as consumption being subject to certain factors of limitation, which makes the strong hold that slate has on discriminating switchboard engineers all the more impressive. The factors of limitation alluded to deserve consideration. The supply of slate is relatively small, Pennsylvania, Vermont, and Maine being the principal producing States, and only a small part of this is sufficiently high in quality to entitle it to the designation: *electrical* slate. Relatively small quantities of Italian and Portuguese slate are imported, and some of these find use in the form of switchboards.

2,000,000 Sq. Ft. Consumed Annually

ON the consuming end, it has been the practice to limit the use of slate to circuits not exceeding 600 volts, alternating or direct current, although it is contended that, if spacings are great enough and the current-carrying metal parts of low enough capacity in relation to the surface of the slate covered by them, 1200 volts can be applied on high-grade slate without excessive leakage. The factors which limit the output of electrical slate are not altogether of the permanently rigid sort. Some years ago when the demand on the Maine and Vermont quarries exceeded their capacity, Pennsylvania producers who until then had not catered to electrical consumers jumped into the breach, and in a short time became recognized factors in the market of which New England had until then had virtually a monopoly. It is, therefore, conceivable that under the stimulus of attractive market conditions, output of electrical slate could be broadened. Some years ago, there was much talk of standardizing switchboard sizes to a point where it would have been possible for slate producers to rationalize their finishing methods to much economic advantage. As matters stand, the line of least resistance by way of expanding the use of slate seems to lie in the direction of structural uses, and bearing this perfectly natural tendency in mind, it is all the more remarkable that the slate industry's electrical sales are more than holding their own. In fact, it is decidedly noteworthy that the use of slate in switchboard installations in commercial and industrial buildings is on the uptrend while in power plants slate is more than holding its own in switchboard use. Next to the roofing industry, the electrical industry continues to be the slate producer's best customer, consuming approximately 2,000,000 sq. ft. a year.

Electrical Slate Is of the Mica Variety

Electrical slate is principally of the mica variety. Nature has for thousands of years conducted a subterranean cementing plant, clay and sand under pressure and heat being united into shale and eventually into slate, the feldspar, kaolin, and iron being converted into a thin, scaly mica. Depending upon the pyrites and other minerals that are not transformed into mica, the color of slate may be gray, purple, red, or green. Monson slate which comes from quarries in Piscataquis County, Maine, and Pennsylvania slate are dark gray and are usually referred to as black slate. The color of Vermont slate ranges from purple to green and some of the slabs in which high color contrast is embodied are in special demand for ornamental walks. Most important for electrical purposes is that the slate must be free from iron or metallic veins that would act as conductors of electricity. So-called ribbons in the quarry formation may delight the eye of the seeker after beauty, but the fewer of them there are in sight, the better pleased is the producer of electrical slate because it is clear stock that he must cut for electrial purposes, ribbons being taboo and, therefore, limiting the dimensions of the slabs.

Mehanical strength and toughness are, however, fully as important requirements in electrical slate as are its insulating properties. One of the outstanding applications of slate is in switchboards called upon not merely to support weighty apparatus, but also to resist the shock caused by the opening of circuit breakers. This calls for a high

modulus of rupture which in electrical slate, according to authorities, ranges from 7000 to 10,000 lb. per sq. in. Tensile strength averages 3625 lb. per sq. in.

While electrical slate must be sufficiently fissile to permit of easy separation in quarrying, it must neither split nor flake under drilling and must not be so hard as to unduly tax drills in that operation.

Electrical slate has a dense, compact structure which stands it in good stead in resisting leakage due to moisture. In one interesting test it was found that an increase of several hundred per cent in insulation resistance was noted in slabs which had been exposed to quarry water, after they had been dried out.

Several tests are used to determine the insulating properties of electrical slate, a dielectric test to indicate the breakdown voltage and various insulation tests to determine leakage current. One of the large electrical manufacturers developed a method of determining leakage current without injuring the test piece. This consumer found that nearly all of the slate that did not meet the standard of insulation, when first tested, could be brought up to it by baking for 24 to 48 hours at 110 deg. C.

Quarrying Methods Have Improved

PERHAPS the greatest progress in recent years in the slate industry has been in quarrying. Formerly channeling machines were used to cut vertical grooves in the slate bed to a depth of 6 to 8 feet. The slate was then split by means of wedges into thicknesses of 6, 8 or more inches. Today, a three-strand twisted steel cable, called a wire-saw, cuts four or five times as much slate per day as a channeling machine, and makes a much neater job of the cutting. When blasting and channeling had to be resorted to, the edges of the slate blocks were frequently injured. The wire-saw cuts clean. It is operated by one man, whereas the channeling machine called for a crew of two. A channeling machine used about 75 hp. while a 7½ hp. motor is sufficient for the power required to operate the wire-saw. All in all, it is stated that the introduction of this mechanism has cut the cost of the primary operation in the production of electrical slate in half. After the blocks have been mechanically lifted to the top of the quarry, they go to a mill where the secondary sawing and finishing operations take place. When the blocks have been cut to the best advantage, they are split by means of wedges to the required thickness, and then go to the planing machine where the roughness of the split face is eliminated. Unless instructions are to the contrary, the back of electrical slate is left "planed" without further finish. The surface is "honed" with carborundum or "sand rubbed" with sand and water, all of these operations being carried out mechanically.

Panels are usually finished by the rubbing in of raw linseed oil or by applying a lacquer consisting of amyl acetate and an aniline black. So as to satisfy the popular demand for color and in order to make slate competitive with materials that are marketed on the strength of the variety of color shades in which they are available, one of the large slate producers has developed a finishing process by which structural slate is surfaced in white, light, or any combination of colors. From copper plates colors are transferred onto rollers that are passed over the slate, some very appealing tones and veined designs being obtained in this manner. Extraordinary precautions, however, are taken to prepare the surface of the finished slate for these processes. These art finishes are applied to slate for structural purposes, and so far have found no utilization in electrical slate. Asked what effect these finishes have on the electrical properties of slate, the manufacturer who has pioneered in this direction, expressed the opinion that the use of slate carefully finished in colors with regard to electrical requirements would be "highly practical." In other words, while the promiscuous use of finishing materials, many of which contain metallic oxides, undoubtedly causes current leakage, there appears to be no technical obstacle to providing slate with color finishes which would be practically harmless from an electrical point of view. Fancy finishes may be applied after drilling and beveling, so as to prevent marring.

Much slate is bought in a semi-finished state by switchboard manufacturers who perform many of the milling and all of the finishing operations in their own plants. Producers of electrical slate, always on guard against the lowering of the electrical efficiency of their product by contamination with metal from the time it is laid bare in the quarry, and the large manufacturers of electrical apparatus who subject slate used by them to exhaustive tests, may be depended upon to avoid all deteriorating pigments in finishing processes, but in the case of smaller switchboard builders it has happened that the insulating properties of a perfectly good piece of slate were sadly impaired by the choice of a finishing material with a metal base.

Insulation Values in Slate Vary Considerably

NATURE has little regard for the requirements of modern industry, and the beds in one and the same slate quarry will show considerable variation in insulation value. An extreme case has been pointed out as illustrating this most forcibly. A Pennsylvania producer has one bed yielding slate that is fit only for linings and utterly useless for electrical purposes. Nearby he has two beds that contain slate which will carry 18,000 volts on 1 in. thick pieces without a trace of leakage. Elaborate apparatus has been perfected for measuring the electrical value of slate in quarry beds.

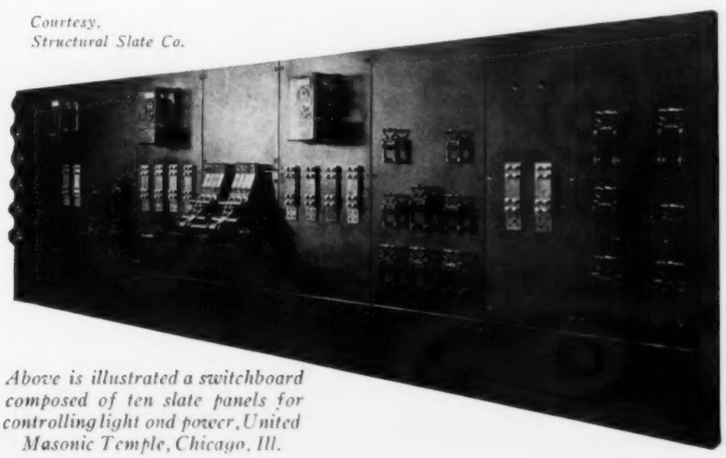
Considerable diversity in the matter of electrical slate specifications persists. One of the largest electrical consumers of slate refrains from specific tests, making it a basic condition that "the slate must be of uniform quality and free from hard streaks or spots, cracks and any impurity affecting the insulating quality." Another large buyer prescribes a minimum transverse strength of at least 7000 lb. per sq. in., uniformity of color without streaks, freedom from metallic veins and conducting material that would reduce the insulation value, air-drying for several months after quarrying and tests to establish dielectric strength and leakage of current at a given voltage.

The following are some of the outstanding uses of electrical slate:

Switchboard Panels
Mountings for Circuit Breakers

(*Continued on page 62*)

Courtesy,
Structural Slate Co.



Above is illustrated a switchboard composed of ten slate panels for controlling light and power, United Masonic Temple, Chicago, Ill.

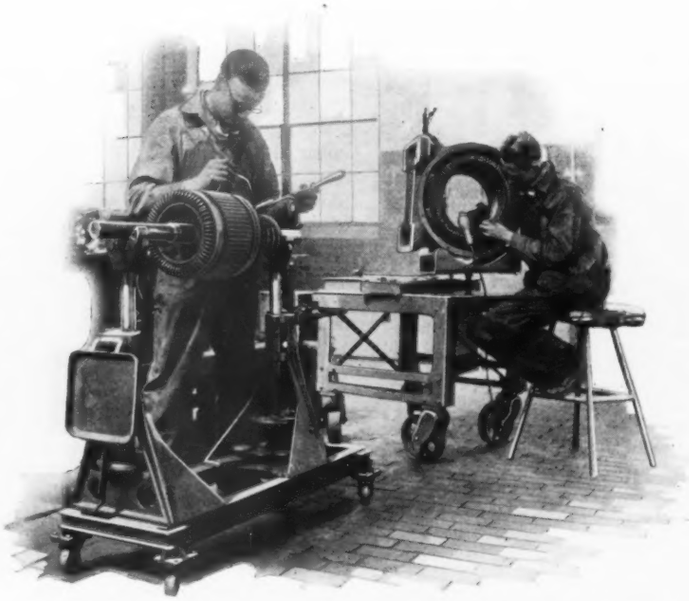
Motor Repair Work in a Railroad Shop

In the modern railroad repair shop where locomotives are reconditioned electrical apparatus plays an important part and to maintain it is a big job

By W. H. Atkins

Electrical Foreman, Illinois Central System, Paducah, Ky.

To maintain some 654 electric motors; all control apparatus incident to their operation; a power plant and a power distribution system; and all plant wiring as well as all electrical equipment on some 20 to 30 reconditioned steam locomotives each month, the Illinois Central Railroad System has provided in its comparatively new locomotive repair shops at Paducah, Ky., a very interesting installation of electrical maintenance and repair equipment.



Repairing motors in the Paducah, Ky., shops of the Illinois Central Railroad system. Notice the modern equipment with which this work is done. The stands are adjustable to suit the different kinds of work

While much of the work performed in the electrical repair department at Paducah is distinctly different than that done in the average commercial or industrial motor repair shop there is sufficient in common to warrant an explanation of what the electrical repair men do at this point, as well as describe the facilities which they have to do it.

The locomotive repair shop at Paducah is comparatively new, being placed in operation in the fall of 1927, and it is one of the principal repair shops on the Illinois Central System. In it practically all heavy maintenance work and reconditioning operations are performed on a large portion of the motive power of the railroad. To do this requires a great number of machine tools, and considerable materials handling equipment, all of which must be supplied with power. Aside from this there is the lighting system and power distribution with their electrical circuits, transformers and no end of switches, switchgear and control apparatus.

In the machine shop at Paducah 315 machine tool motor drives have a total connected load of 3,625.7 hp. For the operation of cranes there are 17 motors having a rated capacity of 2,012.5 hp. In the power plant, for a wide range of different applications there are 26 motors rated at 995 hp. Window sash operating mechanisms require the use of 90 different motors with a capacity of 200 hp., and on the shop jib cranes there are 29 motors rated at 159.5 hp. On vacuum heating pumps there are 9 motors rated at 142 hp., while unit heaters are equipped with 153 motors having 124 hp. On other apparatus such as portable welders, rivet heaters, babbitt furnaces, tire heaters, etc., there are 15 additional motors having a total of 101.3 hp. All in all there are 654 motor units having a total connected load of 7360 hp. These motors operate on alternating current and vary in size from those of fractional horsepower to one of 500 hp., 2300 volts direct-connected to a 3000 cu. ft. per min. air compressor that is located in the operating room of the power plant.

Power for the operation of all this electrical equipment is obtained through a Kentucky Utilities Company 6900-volt substation, located at the north end of the power plant, where three 500-kva. transformers are mounted on a concrete platform. The incoming service is carried in underground, terminating in sealed potheads. Two power lines normally feed the shop through a parallel arrangement protected with cross-connected relays that will clear either line instantly, in case of trouble, without disturbing the load connected to the second line.

The first two breakers control these incoming 6900-volt, 3-phase lines and from these breakers the line is carried to a 6900-volt bus from which connection is made to the third oil circuit breaker and thence to the primaries of the three outdoor transformers. All oil circuit breakers in the high-tension switchgear assembly are 3-pole, 25,000-volt.

Another section of the switchgear comprises the 440-volt equipment for shop distribution. The oil circuit breakers in this section are rated at 4500 volts and no breaker is smaller in current capacity than 800 amperes. A 23-section remote-control switchboard is located in the operating room of the power plant, in which one section is arranged to control the 6900-volt, 3-phase lines, while the remainder of the board controls are for 6900 and 440-volt distribution.

All power and lighting distribution is carried underground, the 6900-volt service being in lead covered cable laid in fibre conduit, while the 440-volt distribution is effected by single-conductor cables in metal conduit encased in concrete. In the 3-phase, 6900-volt primary distribution system there is a total of 10,274 ft. of 7500-volt cable and in the 3-phase, 440-volt secondary distribution system there are 61,126 ft. of copper wire and 18,695 ft. of rigid metal conduit. So that all in all, the proper maintenance of such a vast amount of electrical apparatus is a task of no small magnitude.

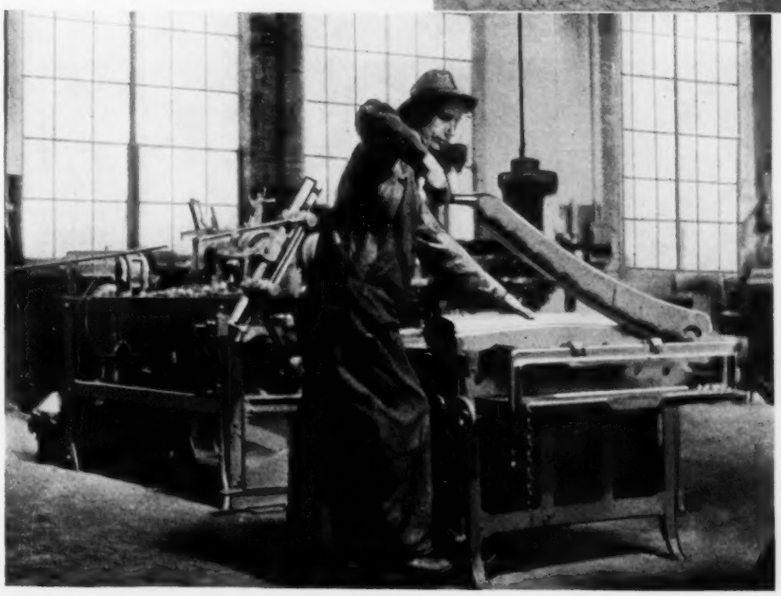
As has already been explained, and aside from the maintenance of the foregoing electrical equipment, the electric repair shop at Paducah is responsible for the upkeep and reconditioning of all electrical apparatus, on all locomotives passing through this shop for repairs each month. This amounts to from 20 to 30 engines and the work includes all removals, repairs and replacements of such apparatus as electric headlights, generators, incandescent lighting circuits and other such appurtenances as are employed on steam locomotives.

To carry out all this work the Illinois Central System has provided an electrical repair department at Paducah that is equipped with an extensive complement of the most modern facilities. And these have been so selected that the electric shop, as it is termed, is adequately fitted to function as a unit, without assistance from other departments in the maintenance section of the locomotive shop.

The electric shop occupies one end of a large brick structure in which are housed several of the other smaller departments of a railroad repair shop incident to the reconditioning of locomotives. This building is conveniently near the other large units of the general shop and is well provided with those features so essential to good workmanship—ample natural light, good heat, and clean, orderly surroundings, with floor space ample for the requirements, the shop having a floor area 67 ft. by 73 ft.

Probably the most essential in the way of equipment are the machine tools. In the Paducah shops these include a radial drill press, two lathes, a shaper, one double floor grinder, and an arbor press and a pipe cutting and threading machine. In the way of motor repair shop equipment there are three impregnating tanks, a baking oven, coil winding, coil taping and coil forming machines. Other essential equipment includes an undercutting machine, a shear for cutting insulation, a portable gas welding outfit, benches, trucks and racks for handling the different types and kinds of equipment undergoing repairs. Also highly essential for this kind of work is suitable testing equipment and this has been provided in the way of a 7½-kva., 440/220-volt, 3-phase, or 440/110-volt, single-phase transformer.

In the way of operation all work in need of attention is brought in and placed in that section of the electric shop to which the various operations in reconditioning electrical apparatus have been assigned. In this respect there is a test



ALL of the equipment in the Paducah, Ky., shops of the Illinois Central Railroad is practically new and is of the most modern type, as may be seen from these two illustrations, which show some of the equipment in use in the electric repair department. At the left is a repairman cutting insulation, while the view above shows but a small section of the machine department of the repair shop. Inasmuch as there are more than 650 electric motors in use in the Paducah locomotive repair shop, in addition to a vast amount of control apparatus and an elaborate power distribution system, all of which must be maintained, 32 men have been assigned the task of keeping this equipment in operation. What they have to contend with and how the work is done is more fully explained in the accompanying article, which describes the electrical apparatus and how it is maintained

bench for testing small armatures and field coils, a stripping bench for headlight generators, a headlight generator repair table and adjustable stands of suitable design for holding heavier rotors and stators. All machine work such as that on bearings, bushings, shafts and pulleys is, of course, done in the machine department. For the handling of the heavier classes of work and for dipping armatures and field coils two portable electric crane trucks are available.

H. P. 20 | Syn. Speed 900 | Mfr. General Electric | Winding | Shop or Mill No. SC 70500
Type KT | Frame 326 | Poles 8 | F.L. Speed 900 | Volts 440 | Form | Temp. rise/F.L. amps 40°/45.8 | Phase 3 | Cycles 60
Serial No. 1184464 | Mfr's Order No. | Our Order No. | Date of Order | Cost
Model No.

BRUSHES: No. | Cat. No. | Size | Material | Grade
BEARINGS: Front End Cat. No. 172688 | Pulley End Cat. No. 172688

COILS: Stator ~~or Field~~ Spec. | Main 307026 | Comm. | Comp | Rotor or Arm. Spec.
PULLEY: Diam. | Face | Bore | Keyway

CONTROL EQUIPMENT: Kind Starting Compensator | Make General Electric | Type NR-1619 | Serial No. | Speed Range Volts Rim. 440. Sec. 176/374 | Accessories

REMARKS: Open

RECORD CARD FOR MOTOR USERS. Furnished by Motor Sales Div., Merchandise Dept., General Electric Company. Card is recommended for stock and inventory, repair part, motor transfer, required power, service, and similar records. (SEE OVER) SMD-39 50m 5-'31-24

ONE of the cards in use in the Paducah, Ky., shops of the Illinois Central Railroad system, upon which workmen enter records of any inspections and repairs to motors. The face of the card has a description of the motor and records are entered on the reverse side

There are at the present time 32 men employed in the electric shop, exclusive of supervisors or the foreman. These include one armature winder, eight electricians, eleven crane operators, five helpers, two helper apprentices, two apprentice electricians, two machinists and one laborer.

Four electricians and two helpers are regularly assigned to locomotive work. Their work consists in removing and replacing all of the electrical apparatus from each of the 20 to 30 engines that pass through Paducah shops each month for reconditioning.

This work at times requires the removal and replacement of all wires and attachments, and as is the practice in locomotive construction all of these wires are run in either flexible or rigid conduit or both, making necessary the removal of many clamps, brackets and hangers, all of which must again be replaced.

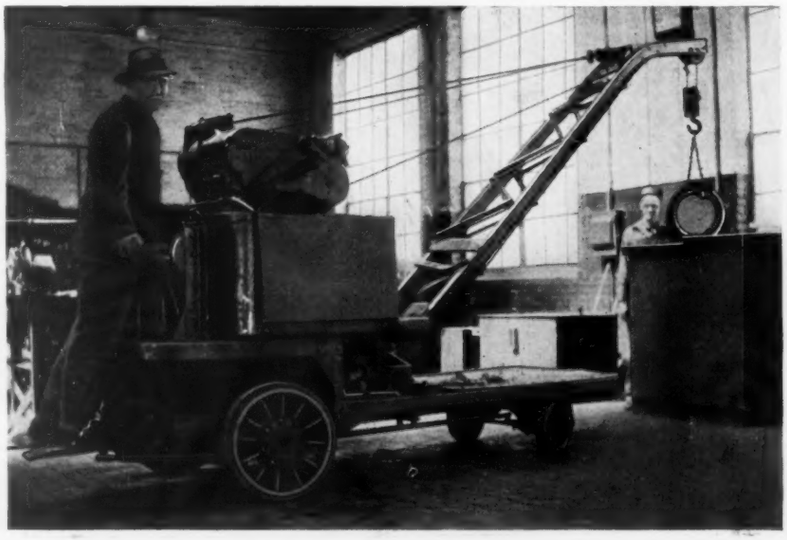
Six of the 32 men are assigned to the general maintenance of the shop equipment. This work includes periodical inspection of all apparatus. Motors are inspected for bearing clearance, and are oiled and cleaned. Cards are provided, similar to that shown in one of the accompanying illustrations, for every motor, and records are maintained on the backs of those cards of inspections, or any repairs made.

Four other workmen are assigned to motor repair work in the electric shop, such as repairing coils and windings and the like, which is done much in the same manner as similar motor repair work would be carried out in an industrial repair shop.

An interesting piece of equipment in this shop is the stator winding stand shown in the illustration on the first page of this article. This stand was designed and made in the Paducah repair shop. It consists of a table, the top of which is made of ¼ by 30 by 30 in. sheet iron fastened to a frame of 3/8 by 3 in. angle iron. This frame is mounted on four legs of 3/8 by 3 in. angle iron 18 in. long and the whole is supported on four heavy duty casters having wheels 8 in. in diameter. The stator rest is 17 in. wide and is made of 3/8 in. boiler steel, having turned up flanges on each side to receive two rollers, one on each end with 14 in. centers. The rollers are made of 2½ in. conduit with a ball bearing in each end, and are fastened to the turned up flanges by means of a stationary shaft. This stator rest will receive stators as small as 12 in. in diameter. It is adjustable from ½ to 10 in. above the table top by means of a threaded shaft. This shaft runs through the top of the table and through a 2 in. nut welded to the hand wheel which is supported under the table and allows the rest to be raised and lowered. On the table at the rear of the stator rest is a 2 by 9 by 30 in. tray with eight compartments for wedges, insulation, etc.

One of the transformers is arranged for convenience in testing motors. This transformer is rated at 7½ kv-a., 440/220 volts, 3 phase, or 440/110 volts, single phase. It is so connected that by means of three switch blades mounted on a movable piece of fiber, the operator can slide the blades and throw the switch for either 220, 440 or 110 volts. By having this switch connected to a pushbutton controller, the desired voltage and starting effect of any motor can be obtained without rearranging the transformer connections. The control circuit of the controller is connected to the 440 volt line.

The new Paducah shop has been in operation for twenty-one months and most of the motors and equipment were new, with the exception of those installed with the machines that were moved from the old Paducah shop, and other outside points. To date there have been twenty motors rewound and completely overhauled, along with general repairs to headlight armatures and field coils for locomotives undergoing repairs and those removed from locomotives on the Kentucky division. The average number of headlight armatures and field coils is thirty-five per month, of which twenty per cent of the headlight armatures were rewound.



SINCE much of the electrical equipment in the Paducah, Ky., locomotive repair shops of the Illinois Central Railroad system is extremely heavy, facilities have been provided in the electric repair shop for handling it. The view at the right shows how heavy rotors are dipped in the impregnating tank. This truck is also employed for the handling of other heavy work in the repair shop

Facts, Figures and Trends

Statistical information of value to electrical manufacturers in working out policies and plans for production and marketing

Mechanical Refrigeration Increases

The mechanical refrigeration industry, including manufacturers of both gas and electrical units, is making material progress, and this year is in a position to begin reaping the benefits of its long period of experimentation, states the Standard Statistics Company of New York as a result of a survey of the industry. Inventories, which a year or so ago were burdensome, not only have been written off or liquidated, but sales have increased to a level necessitating moderate speeding up of production. Leading concerns report sales gains of 25 to 30 per cent over the corresponding period of 1928. Export demand is growing rapidly, with some of the larger producers shipping at least 15 per cent of their output abroad.

Export Trade Higher

With a total value of more than $5,000,000,000, American export trade last year reached its highest mark since 1920, as shown in a bulletin issued recently by the Foreign Commerce Department of the Chamber of Commerce of the United States.

With the single exception of the depression year, 1921, American exports during the last eight years have shown a general upward trend. The value of exports last year, $5,129,000,000, was 5.4 per cent greater than in 1927, averaging more than $427,000,000 a month. It is pointed out that, although the value of exports in each quarter of 1928 was well above $1,000,000,000, the value of shipments for the last quarter amounted to $1,570,000,000, the greatest export value for a quarter period since 1920.

Domestic Consumption of Power Increases

There has been a steady increase in the annual use of electricity by the average domestic consumer, which is accompanied (and, perhaps, to a large extent caused) by a corresponding decline in the average cost of electricity. This gain of 27 kw-hr. per year (or 2¼ kw-hr. per month) per consumer compares with a gain of 25 kw-hr. per year during 1927, and the further possibilities which the continued stimulation of this market holds in the increase in the comfort and convenience of the home are very evident.

Purchasing Power of Dollar Higher

The purchasing power of the industrial wage earner's dollar, based on living costs, at the beginning of the year was 62.2 cents, or higher than the average for any year since 1922, as compared with the purchasing power of the dollar just before the war in 1914, living costs being nearly 61 per cent higher than in 1914. Average weekly money earnings at the beginning of the year, however, were 122 per cent higher, and hourly earnings 133 per cent higher than 1914, with the net result that average real weekly earnings were 38 per cent, and real hourly earnings 45 per cent greater than in 1914.

Swiss Production of Hot Water Heaters Advances

There are at present about nine firms engaged in the manufacture of automatic hot-water boilers in Switzerland. The industry is a relatively new one, and during the early years emphasis was laid upon large boilers for hospitals, hotels, and large public buildings. Today, however, this type of boiler is being installed in practically all new buildings, both large and small. Boilers of all sizes are manufactured, ranging from those with a small 20 liter capacity up to 12,000 liters. There is no definite limit as to the size, decision on this point resting with the power company and the installer.

Utilities Add New Customers

The number of new customers added to the various electrical enterprises during 1928 was 1,371,000 as compared with a net addition of 1,566,000 during 1927 and of 1,654,000 during 1926. The progressive decrease in the addition of new customers may probably be explained by the facts that *practically every community with a population of more than* 1,000 *people now enjoys the benefits of electric service,* that the number of unwired houses in the older cities and towns has rapidly diminished, and that the decline in residential construction (which began early in 1928 and is proceeding with increasing severity up to the present date) has begun to make itself felt.

Electric Current Output for 1927

The total output of electric current reported by electric light and power plants for 1927 was announced by the Bureau of the Census as 74,654,531,374 kw-hr., an increase of 85.3 per cent over the current generated in 1922, as determined in the preceding quinquennial census of electrical industries. The generator capacity is reported to have increased during the same period by 80.3 per cent, being 25,802,530 kw. in 1927. Marked increases were shown also for the horsepower of steam turbines, internal-combustion engines, and hydroturbines in use as prime movers.

Austria's Exports of Incandescent Lamps Decreases

The value of Austria's exports of incandescent lamps to the United States in 1927 amounted to $428,280, as compared with a value of only $110,014 for the year 1928. Practically all of the incandescent lamps exported from Austria to the United States are manufactured by one firm, and are of a rather cheap variety. The firm mentioned states that the decline referred to was occasioned by the reason of the fact that its principal customers in the United States decided to purchase its lamps from Japan instead of Austria on account of lower prices offered in the former country.

German Exports of Household Appliances Doubled

German exports of electric flatirons, heating and cooking apparatus and similar household appliances almost doubled during the two years' period from 1926 to 1928. During the year 1928 these exports amounted to 1,981 metric tons, valued at 10,417,000 marks. Imports amounted to only 160 metric tons, having a value of 857,000 marks.

Production of Power Gains

The total production of electricity in the first quarter of 1929 was 23,633,000,000 kw-hr., an increase of 11 per cent over the output for the same period in 1928. The output for the first quarter in 1928 was only 8 per cent larger than for the first quarter of 1927. No adjustment was made in these figures because of February, 1928, being one day longer than February, 1927 and 1929.

Biennial Census of Manufacturers

The Bureau of the Census has released a summary of returns in the biennial census of manufacturers taken in 1928, giving figures for each State for 1927 in comparison with 1925. The total value of manufactured products reported for 1927 aggregated $62,721,375,881, an increase of $2,138,685,476 over the value of manufactured products in 1925. Of this total, seven States together contributed 60.1 per cent, according to the Department of Commerce.

Employment Increases

Employment in the manufacturing industries of the United States at the beginning of the current year, on the average, was higher than it had been at any time since the second quarter of 1926, the banner year of manufacturing production in the post-war period up to 1928, with indication that the rising tendency is continuing, according to the National Industrial Conference Board.

What's NEMA Doing?

A department covering activities of the divisions, committees and sections of the National Electrical Manufacturers Association

Range Section French Lick Meeting Well Attended

Twenty-four representatives attended the two-day session of the electric range and water heating section at French Lick Springs Hotel, French Lick, Ind., April 1-2. P. L. Miles, of the Edison Electric Appliance Company, presided.

An interesting address on "Building an Industry—What the Future Holds" was given by George A. Hughes, president of the Edison Electric Appliance Company.

Alfred E. Waller, managing director of Nema, discussed the value of statistics in producing the actual facts in industry rather than obtaining information from casual reports. Mr. Waller was of the opinion that statistics based on stocks on hand, shipments, and orders booked over a period of time would prove extremely valuable to the manufacturers in giving an idea of the trend of the market and whether or not they were getting their share. It would also assist in preventing the carrying of too large a stock and tend to economies, which would mean lower cost of manufacturing.

The section voted unanimously to begin the monthly collection of statistics through Nema headquarters on unit sales, dollar sales, shipments and stocks on hand—making the reports retroactive to January, 1928.

E. W. Knight Reelected Head of Fan Motor Section

E. W. Knight, Westinghouse Electric & Manufacturing Company, was reelected chairman of the fan motor section at a recent meeting held at Nema headquarters. L. L. Goding, Wagner Electric Corporation, was reelected secretary. Attendance at the meeting was almost perfect, but one member being absent.

The following committee was appointed to formulate a code of ethics for the fan motor industry and to compile trade practice rules for submission to the Federal Trade Commission: Tom Jones, Century Electric Company, chairman; R. H. Peoples, Hunter Fan & Motor Company; W. W. Mumma, Robbins & Myers Company; E. L. Barkhouse, Emerson Electric Manufacturing Company.

Electric Measuring Instrument Section Adds Standard

The electric measuring instrument section has, with the Standards Committee's approval, added another standard on accuracy limits for current transformers to the standards of their section. The new standard defines the Limit AA ratio and phase and angle accuracy. Current transformers having Limit AA accuracy are accurate within 99.5 to 100.5 per cent, whereas those of Limit A accuracy, the present highest limit, are 99.5 to 101 per cent at 10 to 25 per cent load.

The electric measuring instrument section has also added 175 and 350 volt ratings to voltmeters having 4½ in. scale and larger.

The definitions, abbreviations and symbols of the electric measuring instrument section have also been approved by the standards committee after approval by the joint committee on definitions, abbreviations and nomenclature.

Bannister Will Handle Nema Merchandising Activities

Leland P. Bannister, formerly Atlanta sales manager and district manager in Ohio for the Kelvinator Corporation, has joined the Nema staff. His duties will include matters relating to the merchandising activities of the Appliance Division and of the Refrigeration Division.

L. P. Bannister

Mr. Bannister has had extensive merchandising experience in the electrical appliance field, including organization work, training of salesmen and direction of refrigeration educational classes. After leaving the Kelvinator Corporation in 1927, he joined the Syracuse Washing Machine Corporation as district manager at Chicago. He successively held the positions of district manager at Louisville, Ky., branch manager at Kansas City, Mo., and southeastern branch manager at Atlanta, Ga.

Joint Committee Will Study Fuse Improvement

The standards committee appointed a joint sections committee to consider the possibility of providing fuses utilizing ferrules, blades and clips of such metal or so plated that oxidization will not cause material increase of contact resistance, excessive heating and consequent incorrect operation.

The personnel of the joint sections committee is as follows: C. B. Bradish, chairman, and A. W. Lundstrom, General Electric Company; A. B. Newell and T. A. McDowell, Westinghouse Electric & Mfg. Co.; H. J. L. Frank, Bull Dog Electric Products Co.; G. E. Palmer, Palmer Electric & Mfg. Co.; Joseph Sachs, Colt's Patent Fire Arms Mfg. Co.; H. T. Bussmann, Bussmann Mfg. Co.; N. J. Conrad, Schweitzer & Conrad, Inc.

"Adherence to Nema Standards" Questionnaire Distributed

According to the Standards Committee, most of the sections already having printed standards have sent to their member companies copies of the questionnaire sheet, entitled "Adherence to Nema Standards." In several cases reports have already been received from the section chairmen.

The questionnaire has a two-fold purpose, that of deleting standards not being used and reconstructing other standards, so that they will apply to the latest need of Nema members. It is expected that the information secured in the reports from the various section chairmen will prove invaluable for making up new standards.

Carbon Arc Lamp Standards Are Approved

Two standards of the carbon arc lamp section, curative claims and name plate markings for carbon arc lamps used for health purposes have been approved. The curative claim standard is of interest in that it states that all claims shall be limited to building health to higher levels and as an aid in preventing systematic disorders.

The Standards Committee also approved the standards on heavy duty attachment plugs, prepared by the attachment plug section and approved by the joint sections committee, consisting of the knife and enclosed switch, attachment plug, electric range and water heating and panelboard and distribution board sections.

Some Sidelights on Nema Hot Springs Meeting

Although most of the sections holding meetings at Hot Springs had a very large attendance, some having a representation of 90 per cent or better, the carbon section was the only one to have 100 per cent of its members present.

Prescott Huidekoper, of New Freedom, Pa., associate representative of the American Insulator Corp., flew to Hot Springs from Baltimore on Thursday, May 23.

J. C. Rea, executive representative of the Pacific Electric Manufacturing Co., of San Francisco, Cal., had the distinction of traveling the longest distance to attend the Spring meeting, coming to Hot Springs from San Francisco. A representative of this company usually attends one or two meetings during the year.

Progress in Generator Design and Practice

*Following is the fourth installment of a series of articles treating with developments in the design and construction of electrical equipment**

IN the first of this series of articles, published in the April issue of ELECTRICAL MANUFACTURING, abstracts from statements made by the Allis-Chalmers Manufacturing Company and the American Brown-Boveri Electric Corporation, outlined new developments in the design and construction of electrical equipment for the year 1927-1928 by those companies respectively. The second and third installments of the series were abstracted from a similar statement made by the General Electric Company, as part of a report of the Electric Apparatus Committee of the National Electric Light Association, as prepared under the auspices of its Generating Stations Subcommittee. This, the concluding installment, was abstracted from a similar statement made by the Westinghouse Electric & Manufacturing Company.

The present tendency in the design of generators is toward the more general use of structural steel and fabricated construction. Such material is inherently more suitable than that used in the older designs, due to its absence of flaws and to its uniformity of strength. In fact, its strength and permissible working stresses are quite accurately known, whereas with cast material much dependence must be placed upon the soundness of the casting, which is, unfortunately, a more or less indeterminate factor. Furthermore, the use of fabricated construction has materially increased production, because there has been an elimination of large patterns and a reduction in the amount of machining required, and also because standard structural-steel sections, which are used to a great extent, can be kept in stock.

In the early designs of steam-turbine-driven generators, the frames were made of cast iron and, because the casting included the ducts for conducting the cooling air to and from the core, the frame widths became too great for shipment with the usual railroad clearances. The excessive weight involved is another objection to the cast frame. These objections led to the separation of the frame into two parts; a superstructure of light structural steel for the air passage and a skeleton frame for carrying the core.

This improvement in stator construction has resulted in such design that the heaviest pieces to be shipped weigh approximately 30 per cent less than formerly, and the weights of the installed stators are approximately 15 per cent less. A similar improvement, leading to the construction of structural-steel skeleton frames, has decreased the stator weight for a given capacity by another 10 per cent, and has raised the capacity limit of machines which can be built and wound at the factory from 75,000 kv-a. to approximately 100,000 kv-a.

The use of structural steel for frames and similar parts is a logical extension of the practice of using rolled plate or laminated construction in the rotors of all the more important generators which have been built. The uniform structure of the material can be depended upon and, where this characteristic is essential, complete satisfaction cannot be obtained with castings. The inherent limitations in the use of castings for rotating parts has long been recognized, and in the past their application to such parts has been made chiefly in low-speed machines.

During the past year, fabricated construction has been adopted for the standard lines of moderate-size low-speed horizontal and vertical synchronous motors and generators, general-purpose synchronous motors and the corresponding sizes of generators, direct-current generators and motors, and 3600-r.p.m. steam-driven turbo-generators. The full benefits of the fabricated construction have been obtained through complete redesign of the lines of machines in question.

Several illustrations may be given of present designs employing structural steel. A 7500-kv-a., 225-r.p.m. vertical waterwheel generator built for the city of Eugene, Ore., is of particular interest in that it is built entirely of fabricated material; the frame, the upper bracket and the lower bracket are of structural steel, and the rotor consists of a steel rim and I-beam spokes. The Aluminum Company of America has recently ordered two 45,000-kv-a., 150-r.p.m. vertical waterwheel generators, each of which will be built with a structural-steel frame and a structural-steel lower

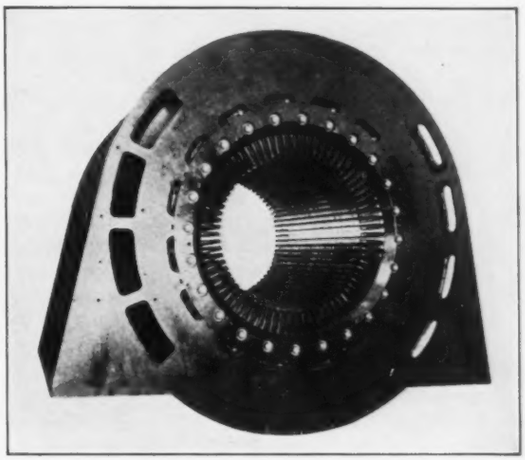


Figure 1

Here is a good example of the construction formerly used by the Westinghouse Electric & Manufacturing Company in frames, before the recent developments and applications of welding

*Abstracted from a report of the Electrical Apparatus Committee of the National Electric Light Association, as prepared for the year 1927-1928, under the auspices of its Generating Stations Subcommittee.

bracket; the rotor will be built of structural arms and hubs and a laminated rim. For the W. S. Barstow Management Corporation's Saluda River development, the four 40,625-kv-a., 138-r.p.m. vertical waterwheel generators will be unique in that they will be of the umbrella type, with only one guide and one thrust bearing, mounted below the rotor, from the lower bracket; the usual upper bracket will not be furnished, although a support for the direct-connected exciter will be necessary. The umbrella machines will have a structural frame and a structural lower bracket, but the rotor will be of the cast-steel center-laminated-rim type; no oiling system will be required, since the thrust bearing and the guide bearing will operate in a flood of oil.

The size of machines is increasing from year to year in

Figure 2

The fabricated frame of a Westinghouse vertical waterwheel generator that has been developed since the application of welding to the construction to this type of apparatus

order to satisfy the needs of the industry. The largest machines so far constructed, from the point of view of physical dimensions, are the 40,000-kv-a., 81.8-r.p.m. vertical waterwheel generators at the Conowingo Station of the Philadelphia Electric system. The largest steam-turbine generators constructed to date are the two 94,000-kv-a., 1800-r.p.m. machines comprising the cross-compound unit for the Hell Gate Station of the United Electric Light & Power Company. There has also been completed a 12,500-kv-a., 3600-r.p.m. steam-turbine generator with shaft fans of novel design. Three 30,000-kv-a. synchronous condensers have been built for operation at 720 r.p.m.

The Conowingo generators are, as previously stated, physically the largest generators ever constructed, each machine having a weight of approximately 1,140,000 lb. and an overall diameter of approximately 37 ft. Each unit is complete with an auxiliary shaft alternator, which furnishes power to a motor-generator set, which in turn furnishes the excitation for the main alternator. The auxiliary alternator is excited by means of a small direct-connected exciter.

The rotor construction of the large 1800-r.p.m. machines, as in the past, is of built-up plate. On the largest machines built, however, the rotor plates have a large central bore, possible only in rotors of this construction, such an arrangement providing greater facility for rotor cooling. Oblique holes, drilled in the shaft ends before assembly with the plates, carry a portion of the cooling air to the center of the rotor. The remainder of the air is carried through the teeth by means of axial holes in the end portion of the rotor. Radial slots, cut into each rotor tooth before the plates are assembled, serve to discharge the air from the center of the rotor.

The 12,500-kv-a., 3600-r.p.m. steam-turbine generator referred to was built for the Kansas City Power & Light Company. The machine has self-contained fans of novel design, the measured fan efficiency being 43 per cent, double the efficiency of any shaft fans previously designed to meet the difficult conditions imposed by large 3600-r.p.m. generators.

During the past year there has been developed a new line of synchronous condensers rated at from 500 kv-a. to 30,000 kv-a., embodying the latest practices in mechanical construction. Structural-steel frames and bed plates, and laminated punched rotor centers are used. New sleeve bearings have been designed, with special features to prevent oil leakage, these features being based upon the air-by-pass principle and the entire line of bearings has been designed in such a manner as not to require water cooling. In case additional cooling is required, the oil is circulated through an external cooler, located in the foundation air duct. This design avoids the use of water-cooled pipes in the bearing shell, which, in some cases, have led to bearing failures, and is of particular importance in the substation so located that cooling water is expensive.

In connection with the building of the second 40,000-kv-a. frequency-converter set for the Commonwealth Edison Company, a frame-shifting device of a new hydraulic type is being developed. This device consists of two pistons and hydraulically connected cylinders, with the necessary pressure-applying equipment.

Several improvements have recently been made in the design of bearings and in the arrangement of oiling systems in order to lengthen the life of the oil, to reduce the amount of leakage and otherwise to improve lubrication. These improvements may be said to have eliminated certain oiling difficulties which are experienced in operation and which may largely be attributed to two principal causes, viz., the drawing of oil vapor out of the bearings and oil fans by suction created by the rotor, and the flow and creepage of any excess oil fed to the bearings. In the past it has been necessary to adjust the oil flow to the bearings to almost the exact amount required, i.e., sufficient oil had to be supplied adequately to lubricate the bearings but no excess could be permitted since such excess would be likely to overflow and to find its way into the machine itself.

The so-called pressure overflow system has been developed to remedy the difficulties experienced with the old method of lubrication. In the new system, the oil is discharged from the pump and is carried to a header, where the feed lines to the various bearings are connected. In the header is a pressure-relief valve adjustable for pressures

Figure 3

The fabricated lower bracket of a Westinghouse Electric & Manufacturing Company vertical waterwheel generator. It is made up principally of welded structural steel shapes

of from two to ten pounds per square inch, the arrangement being such that any pressure between these limits can be maintained practically constant at the point where the three connections for the bearings feeds are made and the oil flow to individual bearings is therefore not influenced by the adjustment of oil flow to any other bearing. It can readily be seen that, if more oil should be fed to one of the bearings than to either of the others, less oil would overflow to the relief valve and the pressure at the point where the feed lines are connected would therefore remain practically unchanged. In addition to the fact that vapor formation and oil creepage are practically eliminated by the new oiling system, there is the marked advantage that oil will be delivered to the bearings, as the generator is started from rest, much sooner than with the old system.

In the new system, overflow connections have also been provided at the top of each guide bearing. These connections permit excess oil to be supplied to each bearing as an assurance of adequate lubrication, but without any danger of flooding the machine.

It has been customary in the past to return the oil from the upper guide bearing directly to the lower oil pan, through pipes in the rotor, with a consequent tendency, due to the rotation of these pipes, for the production of vapor where the oil would be discharged from the pan. The present practice is to provide a stationary oil pan beneath the upper guide bearing, from which a drain is connected to the lower pan.

Some attention in recent years has been given to so-called outdoor generators. So far as the generator itself is concerned, investigation seems to indicate that there is little in the requirements for this service necessitating modification of the present type of construction. Generators of standard construction, but with housings for protection and ventilation, have been installed in a number of instances. These may be more logically termed semi-outdoor installations, and actually represent no departure from ordinary practice insofar as generator design is concerned. The novelty is found in the reduction of the building to the simplest structure, location being permitted in the dam or other advantageous place. It has even been proposed that the usual frame be omitted and the various parts of the generator built into and supported by the the concrete foundations. There is little merit in this scheme, since some supporting structure for the stator punchings would be necessary in any event and since the problem of alignment would be extremely difficult of solution.

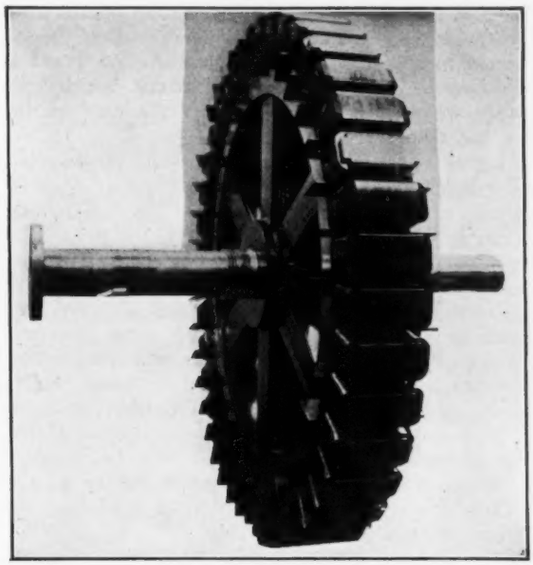


Figure 4

An instance of the possibilities in building up rotors for electric generators. Here is one constructed by the Westinghouse Company for a waterwheel generator

Power-operated brakes are occasionally installed in connection with automatically controlled waterwheel generators. The value of brakes appears to lie principally in the assurance that the waterwheel will be brought to a complete stop when not delivering power. Water leakage sometimes causes rotation in reaction-wheel installations and, under such conditions, the brake will prevent useless wear and tear or being the unit to rest for inspection or repair. The necessity for the extra expense and complication of brakes is much reduced when leakage can be controlled. There appears to be little excuse for the use of brakes where the driving force can be positively removed, as it can in the case of impulse-wheel installations.

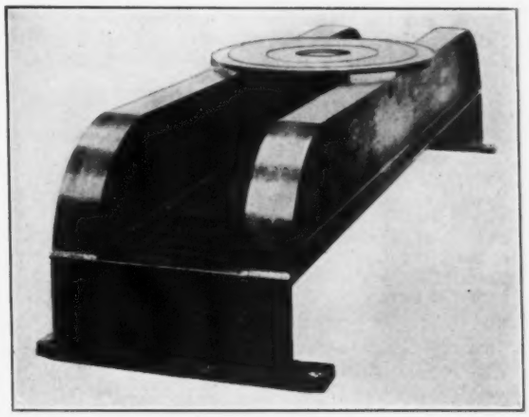


Figure 5

A built-up lower bracket for a Westinghouse waterwheel generator. As was the case with the upper bracket shown in Figure 3, *this bracket is made principally of welded steel*

Although no major changes are being contemplated in the insulation of armature windings for small and moderately sized machines, the question of armature-coil insulation has been given considerable study in preparation for larger units. The stator coils have been insulated for a number of years with a micafolium wrapper on the straight parts and with treated tape on the ends; the individual strands in the coils and the completed conductors have been insulated with mica tape throughout their entire length. The advantage of the treated tape is that it is flexible and can withstand the slight movements of the coil ends that will occur on short circuits.

In preparation for higher operating voltages than 13,800, a special coating for the outside of the coils has been developed to decrease the corona between the sides of the coils and the sides of the slots. If a perfect contact could be made between the coil and the sides of the slots throughout the latter's length, such corona would not exist; if, however, the coil side touches the slot only at points, there is corona from the other points of the coil side. A semiconducting film is therefore required on the surface of the coil in order that all points may be kept at ground potential. Experiments have demonstrated the effectiveness of such a conducting film.

Considerable importance is at present attached to the question of using higher voltages for generators of large capacity. Whereas, so far as the manufacture of the machine is concerned, a unit having a capacity of 100,000 kv-a. can be rated at 13,800 volts, nevertheless the cost of circuit breakers, disconnecting switches and busses makes it desirable to build such machines, especially for new generating stations, with terminal voltages as high as 22,000.

Slate—Its Electrical Uses

(*Continued from page* 53)

Arc Shields and Barriers on Circuit Breakers
Bases for High Tension Switches
Motor Generator Set Panels
Bench Boards
Bases for Switches and Fuse Blocks
Farm Lighting Control Panels
Arc-Welder Regulator Panels
Face Plates for Motor Starters and Speed Regulators
Division Walls for Reactance Coils
Linings and Division Walls for Oil Switches
High Tension Switching Equipment
Terminal Boards for Transformers
Cable Clamps for Transformers
Slotted Blocks for Low Tension Bus-Bar Supports
Contactor Panels for Industrial Motor Control
Field Rheostats
Bases for Control Mechanism of Electrical Refrigerators
Panels for Electric Printing Press Control
Panels for Electric Control of Fans, Blowers, Pumps, etc.
Crane Hoist Control Panels
Bases of Desk Portables
Floor Insulation

Aside from the promotion of the slate industry's interests through its national organization, the National Slate Association, individual producers maintain highly efficient service departments that are at the beck and call of electrical manufacturers confronted by problems into which enters the application of slate in one form or another. One of the large slate producers who markets special finishes, obtained by the application of a nitrocellulose lacquer, under a proprietary name, has had much success in extending the use of slate as an artistic wall material, especially suited for pilasters and fireplaces where solidity of decorative effect is desired. It is easily conceivable that, because of its excellent insulating properties, slate will be more and more called upon to double in the role of a structural material that lends itself to decorative treatment, and combines with this the utilitarian property of furnishing safety and efficiency in connection with electric wiring for light, heat and power.

"Where Do We Go from Here?"

(*Continued from page* 23)

stability which must be rated as high when we consider the readjustments in every department of economic life made necessary by the post-war crisis and by the transition from war economy to peace economy, and while America has a promising future, the outstanding fact which is illuminated by this survey is that we cannot maintain our economic advantage, or hope fully to realize on our economic future, unless we consciously accept the principle of equilibrium and apply it skillfully in every economic relation.

The forces that bear upon our economic relationships have always been sensitive. All parts of our economic structure from the prime processes of making and of marketing to the facilitating functions of finance, are and have been interdependent and easily affected. And therein lies the danger: That through ignorance of economic principles, or through selfish greed, or inadequate leadership, the steady balance will be disturbed, to our economic detriment.

To maintain the dynamic equilibrium of recent years is, indeed, a problem of leadership which more and more demands deliberate public attention and control. Research and study, the orderly classification of knowledge, joined to increasing skill, well may make complete control of the economic system a possibility.

In the marked balance of consumption and production, for example, the control of the economic organism is increasingly evident. With the development of a stream of credit to facilitate business operations, and with flexible power to energize industry and to increase the effectiveness of the workers, has come an increasing evenness in the flow of production. Once an intermittent starting and stopping of production-consumption was characteristic of the economic situation. It was jerky and unpredictable, and over-production was followed by a pause for consumption to catch up. For the seven years under survey, a more marked balance of production-consumption is evident.

With greater knowledge of consuming habits, with more accurate records of the goods consumed, a sensitive contact has been established between the factors of production and consumption which formerly were so often out of balance.

Where pools of goods once were accumulated by the manufacturer, the wholesaler, the jobber, and the retailer; where high inventories once meant distress, shutdowns, failures, and unemployment whenever the demand subsided, there is now a more even flow from producer to consumer.

Increasing skill and scientific data have made the anticipation of demand far more accurate, and by accurate anticipation the deliberate balance between production and consumption has in a measure been maintained. By advertising and other promotional devices, by scientific fact finding, by a carefully predeveloped consumption, a measurable pull on production has been created which releases capital otherwise tied up in immobile goods and furthers the organic balance of economic forces. In many cases the rate of production-consumption seems to be fairly well under control.

To maintain this balance, and to extend it into fields which are not now in balance with the more prosperous elements of the nation, is clearly an important problem of leadership. With certain natural resources still wastefully exploited, with great industries, such as agriculture and coal mining, still below the general level of prosperity, with certain regions retarded, there remains much to do. To bring these more fully into the stream of successful economic forces is a problem of the first order.

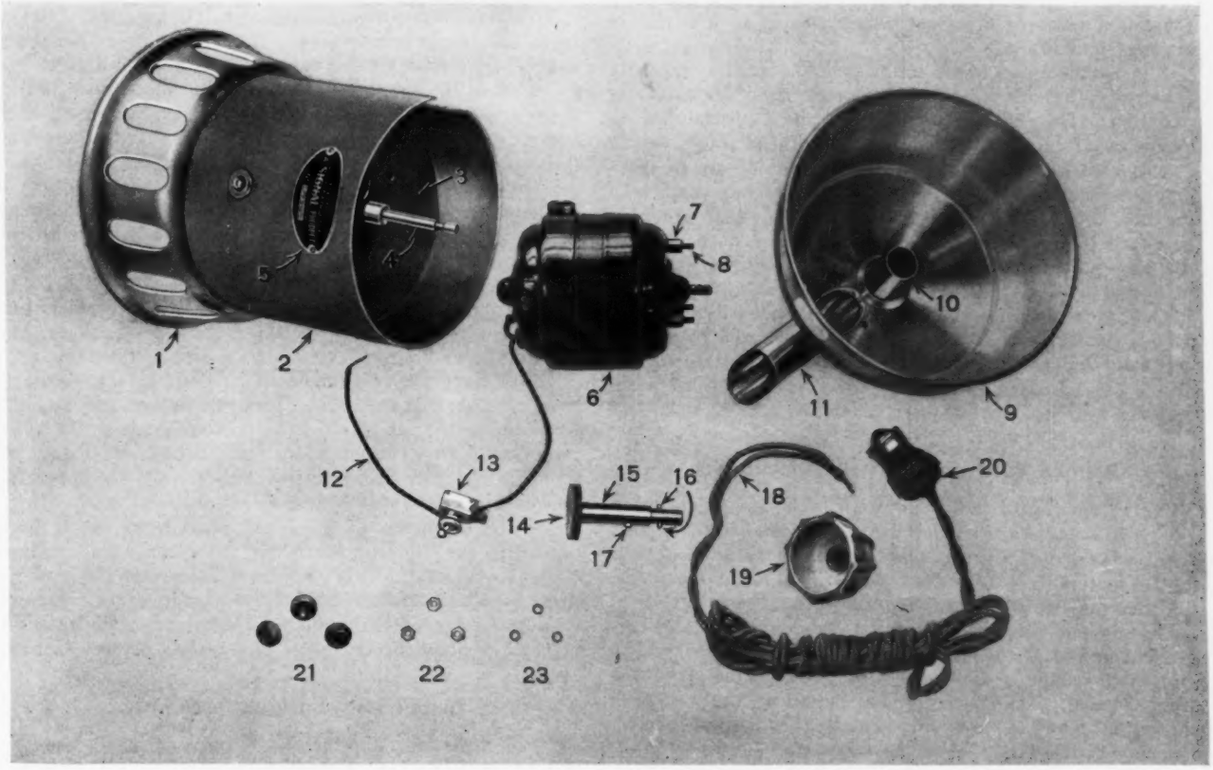
Our complex and intricate economic machine can produce, but to keep it producing continuously it must be maintained in balance. During the past few years equilibrium has been fairly well maintained. We have not wasted the hours of labor by strikes or lockouts. Until recently we have not diverted savings from productive business to speculation. There has been balance between the economic forces—not perfect balance, but a degree of balance which has enabled the intricate machine to produce and to serve our people.

As long as the appetite for goods and services is practically insatiable, as it appears to be, and as long as productivity can be consistently increased, it would seem that we can go on with increasing activity. But we can do this only if we develop a technique of balance. Toward such a technique the committee believes the skillful work of the economists, engineers, and statisticians who prepared the survey on which we have based the facts and interpretations expressed in this brief report, will contribute. Our effort has been to suggest a pattern by which their work may be appraised; to set up an orderly plan by which the facts may be articulated and against which later and better information may be more accurately judged. We recommend a study of the fact finding survey as a whole to all who are faced with the problems of business administration and public leadership.

Informed leadership is vital to the maintenance of equilibrium. It depends upon a general knowledge of the relations of the parts each to the other. Only through incessant observation and adjustment of our economy, can we learn to maintain the economic balance.

Juice Extractor Parts

Juice extractors are rapidly becoming a household commodity and while their construction is not very complicated they require many kinds of materials



ELECTRICAL MANUFACTURING *acknowledges the assistance of the Signal Electric Manufacturing Company, Menominee, Mich., in the preparation of the accompanying illustration, showing the construction details of electric juice extractors. The following table lists the various sparts of the extractor and at the same time shows the various kinds of materials employed in its construction*

ARE you supplying your share of the many different kinds of materials now being consumed in the construction of electric juice extractors?

As may be seen from the accompanying table these include almost every common type of material used in electrical construction and, while their number is not large, there is a potential market

Part No.	Description	Material
1	Base	Aluminum
2	Body	Steel
3	Sub-base	Steel
4	Drive shaft	Steel
5	Name plate	Brass
6	Motor	
7	Nut	Steel
8	Screw	Steel
9	Pan	Aluminum
10	Funnel	Aluminum
11	Spout	Aluminum
12	Wire	Copper and insulation
13	Switch	
14	Gear	Fibre
15	Shaft	Steel
16	Driving pin	Steel
17	Pin	Steel
18	Cord	Copper and insulation
19	Extractor	Aluminum
20	Attachment plug	
21	Feet	Rubber and steel
22	Nuts	Steel
23	Lock washers	Steel

Manufacturing Electric Fans

(*Continued from page 27*)

tion paper cut and formed for the purpose, then four coils are assembled into each core after which the connecting leads are assembled and taped, connecting the four coils with one lead.

After the assembly of the stator the next operation is that of testing for watt output, shorts, and for direction of rotation, this last operation being done on a Westinghouse designed jig or fixture made for this purpose.

The stator is then placed inside of this fixture in which there is a rotor or armature which rotates as it would in an electric fan.

The complete and tested stator is then placed in specially constructed baskets which hold approximately 70 stators at one time. This basket is submerged in a special baking varnish, and the baskets are hung on overhead tracks, which are so constructed as to allow an amount of air to thoroughly circulate between the stators and coils until they are dry. After the stators are dry, the baskets are conveyed on their overhead tracks into a steam oven adapted for baking fields and stators at 105 deg. Centigrade, taking 15 hours to bake.

The tracks mentioned continue through each oven and convey the baskets out at the other end of the oven to a vertical grinder for the grinding of the internal diameter of the stator, after which it is now ready for assembly into the fan case on the main assembly line.

Choke Coil and Switch Assemblies

THE winding of the choke coil for the switch assembly is in many ways similar to the winding of other coils, being wound on universal winding machines, after which the laminations are assembled with the coil and are ready for their assembly to the porcelain switch base.

This assembly is then inspected, submerged in varnish, and baked for 15 hours in the baking oven after which the switch handle is applied and the leads to the terminals are assembled. The choke coil and switch are then screwed on to the felt base and pan, and is then ready for the assembly to the fan base on the main assembly line.

Included in the sub-assembly groups that gradually lead up to the continuous assembly is the trimming of the fan case that is delivered from the polishing room. It then passes to the paint department for the application of two coats of dull black varnish, after which it goes to the oven and then back to the sub-assembly for the assembly of the swivel stud and gear case cover that is riveted on. From this point it passes through a tapping machine to be tapped for the swivel stud.

The swivel cover, pin and stud are assembled to the fan cover with the aid of another Westinghouse jig designed and constructed for the purpose. This jig consists of a shaft extending horizontally from an upright piece on which is a large flat wheel, the stud and pin are placed in an insert at the end of this shaft by the operator. The fan cover is then placed over a special fitting that slides back and forth on a two way slide, after which the operator places the swivel cover over the hole (made for the purpose in the cover) slides the cover forward on its jig against the shaft (in which is inserted the stud and pin). At the same time the wheel is forced backward against a pulley on the shaft of ¼ hp. motor, that operates automatically. In this manner the stud, pin, and swivel cover are riveted.

The Westinghouse name plate is then applied and is ready for the pressing in of the field.

Another operation in the sub-assembly, is the machining of the die cast gear case, that is at first rough reamed. The pinion hole is then reamed, the oscillating stud hole is reamed, after which comes the tapping of the mounting and rear cap hole. The worm gear hole is then bored, faced and reamed, and the mounting fit is faced and turned.

The case and field assembly, after being pressed in by air pressure, is then mounted on a lathe where it is bored and faced for the bracket fit, this boring being done from the same working point from which it is internally ground, thus insuring concentricity of the bearing fit to the bore of the field coil.

This case and field assembly is then conveyed to the next operator who assembles the cover and the gear case after which they are line reamed to ±.0005 in. limits, thus insuring the bearing being to size.

This assembly is then assembled to the base that is taken from the overhead conveyor. It then continues down the endless conveyor to the inspectors and operators to the assembly of the rotor and the oscillating mechanism. From there it goes to the assembly department where the switch and choke coil are added to the bottom of the base and this completed assembly is now ready for the assembly of the blade and guard.

There are several interesting operations in the assembly of the fan blades to the spiders that have to do with the balancing and contouring the blades.

The blades and spiders are first inspected for markings, scratches, etc., then the blade is riveted to the spider, balanced and contoured on special fixture designed for the purpose, depending, of course, on the size of the fan.

This fixture is very simple in its design. The blade is fitted on a shaft that extends from this fixture and is of the same size as the fan shaft. The contour gage on the other end of the fixture is then placed against the blade to gage its contour. If the blade is out either way the operator remedies this defect with the aid of special pliers.

For the balancing of the blade another fixture is used similar to the one for balancing the rotor. This fixture is similar in that it has two level knife edged pieces of steel, on which another solid fixture made up to represent a rotor is placed. This solid fixture has an extended shaft to which is fitted the fan blade to ascertain perfect balance.

Inspection of Blade Assembly

THE blade assembly then passes to an inspector and on to another operator who sprays the assembly with a black varnish, using a spray gun, after which the assembly is placed on a rack nearby to dry, taking about 5 minutes.

After the blade assembly is dry it is placed along with a fan guard on an overhead conveyor that carries both up over the main aisle to the main assembly line for assembly to the fan.

At the end of each assembly conveyor an inspector is stationed to give every 8-10-12 or 16-in. fan a rigid preliminary inspection and running check before the fans are loaded on their respective racks for a two hour heat test.

The loaded racks are moved onto electrified suspended tracks. All fans having more than one speed are run on each speed for a definite period, in order to thoroughly warm up the choke coil or resistance unit of the three speed switches. After the two hour period the fan rack is moved into one of the noise proof test booths. These booths or rooms are of double wall construction, and are well ventilated and illuminated. Each booth is equipped with two test positions capable of handling over 400 fans a day. Every fan is tested for starting on voltage 20 per cent below full line voltage, watt input, r.p.m. on each one of the speeds, oscillation and quiet performance.

A novel method for determining the speed of fan blades has been provided. This device consists of a motor driven magneto which actuates an r.p.m. meter located in plain view of the tester in the booth. A non-pitch or flat four-blade fan is mounted on the shaft of the small motor driving the

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magneto. This entire outfit is located on the outside of the test booth in front of a window in order to eliminate all noises that might interfere from the inside. The fan blade on the small motor is running in synchronism with the speed of the fan being tested. This can easily be observed when looking through the blades on the fan directly at the blades on motor located on the outside of window. The motor speed is regulated to a point that makes the blade appear to be standing still and the tester then reads the revolutions recorded on the r.p.m. meter. Every fan must meet definite limits on all speeds. It can readily be seen that no friction is imposed on fan as would be the case if a tachometer were used.

After test all fans are carefully cleaned and submitted to a final inspection where they are again operated on all speeds as well as given a rigid inspection as to workmanship and finish. The fans are then placed in an orderly manner on the shipping bench, ready for packing.

Ceiling fans are inspected and tested with a similar degree of exactness. Each unit, motor and blades, is given careful attention by experienced men. Particular care is taken in balancing the blades of which four are required per fan. The blade feet or brackets and the individual blades are weighed, marked and matched in sets. Each set of blades is assembled on the motor and checked for being in running balance.

A final inspection determines quality of workmanship and finish of motors and blades.

Industrial Motor Enclosures

(*Continued from page* 33)

the standard primary and sheet copper covers extend from these adapters to the shaft. Felt washers on the covers at the shaft and machined fits between covers and adapters and between adapters and end shields provide ample protection to the vulnerable parts of the motor against dust or metallic particles that may be suspended in the surrounding air. Figures 11 and 12 show two views of a stator with the enclosing parts in place.

The rotor blowers maintain a constant circulation of the internal air that aids in the transfer of heat from the windings to the enclosing parts. The external fans rotating between the enclosing covers and brackets draw cool air through the bracket openings and force it over the surface of the enclosing parts and stator core, thus increasing the rate at which the heat generated within the motor is dissipated. Figure 13 shows the external fans and their positions relative to the rotor core.

Another type of totally enclosed fan cooled motor for direct current applications is shown in Figure 15.

In recognition of the demand for simplicity and interchangeability of parts, the standard type construction and parts were utilized to the fullest extent in the fan cooled motor. All mechanical parts with the exception of the shaft are interchangeable with those parts used on the present totally enclosed motor of the same frame size.

In this motor the windings are totally enclosed and a fan is mounted outside the enclosure at the commutator end. The fan blows in over the enclosure and the motor is cooled by this circulation.

The cooling system does not interfere with the effectiveness of the motor enclosure. The bracket openings are closed with solid flat enclosing covers and gaskets. This type of construction permits the use of sealed sleeve bearings and thus the motor is totally enclosed and sealed from dust and fumes.

The commutator end of the motor is further enclosed with a sheet steel cover that has a perforated protective end through which the fan draws the cooling air. The cooling air is directed over the bracket and passes out over the top of the motor, covering approximately three quarters of the surface of the motor.

Testing Motor Drives with Instruments

(*Continued from page* 43)

the true watts of the circuit and the apparent watts. Then the true watts divided by the apparent watts equals the power factor. True watts are obtained by the reading of a wattmeter. Apparent watts are obtained by multiplying amps. $\times$ volts as obtained from the readings of an ammeter and a voltmeter. In the case of a motor test using a polyphase wattmeter connected as shown in Figure 6 or Figure 7, an ammeter should be connected in series with each of the current circuits of the wattmeter and a voltmeter across the potential circuits to the wattmeter. If the loads on the two current circuits of the wattmeter are balanced the readings of the two ammeters will be alike. If they are not alike the average of the two readings should be taken, and used in the following formula:

P.F. = Wattmeter reading $\div$ (amps. $\times$ volts $\times$ 1.732).

When it is required to determine the power factor of a circuit accurately and frequently, a standard power factor instrument should be used. Low power factor of a circuit represents an economic waste that is expensive to all concerned and should be corrected. Fully loaded induction motors will have their highest power factor and also efficiency so that it is just as important to be sure that the rating of an induction motor on a machine is not too large as it is important to know that it is not too small. This subject will also be taken up in a later article.

H. P.	SYN. SPEEDS	LOADS		
		½	¾	Full
2	1800	78	81.5	82.5
2	1200	83	84.5	85
3	1800	86	87	87
3	1200	83.5	85.5	86
5	1800	84.5	86.5	87
5	1200	85	87	87
7½	1800	84	86	86.5
7½	1200	85	86.5	87
10	1800	88	89	90
10	1200	85	87	87
15	1800	87	89	90
15	1200	86	87.5	89
15	900	87	89	89
20	1800	87	89.5	90
20	1200	87	89	89
20	900	86	88	88.5
25	1800	88	89	89
25	1200	88	89	89.5
25	900	87	88.5	89
30	1800	87	89	90
30	1200	88	89	90
30	900	89	90	90
40	1800	88	89	90
40	1200	87.5	90	90
40	900	89	90	90
40	720	88.5	89.5	89
50	1800	84	87	87.5
50	1200	88	90	90.5
50	900	88	90	90.5
50	720	89	90	90
50	600	89	90	90

Table 4

Approximate efficiencies of 60 *cycle polyphase induction motors of the squirrel cage induction type operated on standard voltages of* 220, 440 *and* 550 *volts*

The illustrations used in this article are taken from a booklet, "Electrical Testing in Industry," published by the Weston Electrical Instrument Corporation, Newark, N. J.

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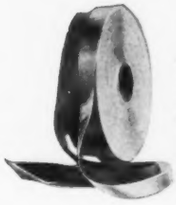

The use of commutator segments and rings of Super-Micanite, in both manufacture and repair work, is growing by leaps and bounds. In the short space of three years Super-Micanite has become the outstanding bonded mica insulation. It assures longer life and reduced maintenance even under the most severe operating conditions.

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Electrical Manufacturing News

A department containing news, and descriptions of new materials, parts and devices for the manufacture and repair of electrical products

Screen Grid Tubes and Remote Control Features Prominent in Exhibits at R. M. A. Show

With a registration of 31,589, a new record, the Third Annual Radio Trade Show, conducted by the Radio Manufacturers Association in the Stevens, Blackstone and Congress hotels, Chicago, June 3-7, indicated that some of the merchandising features of the coming radio year will be: more dollar value for the consumer, style with more attractive price, better reception with screen grid tubes, improved dynamic reproduction, remote control as well as automatic tuning, console furniture of plainer and less modernistic design and increased competition in the low-price field.

H. B. Richmond

A total of 227 manufacturers exhibited more than $1,000,000 worth of radio merchandise, filling the exhibition floor in the Stevens and overflowing through most of the floors of that and the other two hotels. Plenty of stocks were ordered, and if enthusiasm at the show was a sound criterion, radio is in for its greatest selling year.

Some at the show saw no reason why radio should expect larger sales this year than last, even believing that total volume would fall below that of last year. They argued that there would be no colorful presidential campaign to help boost sales this year, and that the screen grid tube, seen everywhere among the receiver exhibits, might not be in sufficiently large volume production to warrant the expectation that it would act as a large impetus to sales immediately. Predictions of a $650,000,000 sales volume year were not uncommon, and some were so optimistic as to predict a volume of $1,000,000,000.

Of the 227 exhibiting manufacturers, 23 per cent showed receivers. Tube manufacturers represented ten per cent of the total number of exhibits, a majority making complete lines, but those featured were the 227, 224, 245 and 280 rectifier. Some receivers used no screen grid tubes at all, but these were in the minority.

Patented antennæ and various types of antenna kits featured the parts exhibits. One exhibit included a home motion picture camera and projector with sound reproduction accompaniment. Five per cent of the exhibits were devoted to electric phonograph pick-ups, one being concealed in an end table. Four booths showed testing equipment and four portable receivers, only one of which uses the screen grid tube. Television was all but absent from the show.

Among the companies exhibiting receivers for the first time were:

Associated Radio Manufacturers, Inc.; Balkeit Radio Co.; Gulbransen Piano Co.; Silver-Marshall, Inc.; Story & Clark Piano Co.; Temple Corp.; Victor Talking Machine Division of Radio-Victor Corporation of America; United Reproducers Corporation. The latter company showed a new condenser type speaker, the Kylectron, named after its inventor, Colin Kyle. This speaker was used for broadcasting music and announcements through all exhibition halls and hotel lobbies.

The fifth annual convention of the Radio Manufacturers Association and the summer meetings of the Federated Radio Trade Association, the Radio Wholesalers Association, the Radio Retailers Association, the Manufacturers' Representatives Association, and the National Association of Broadcasters were held during show week.

The new president of the R. M. A. is H. B. Richmond, treasurer of the General Radio Company, Cambridge, Mass., the first president to come from the engineering profession. He has been director of the association's engineering division, in which position he is succeeded by Walter E. Holland, chief engineer of the Philadelphia Storage Battery Company.

C. L. Benjamin New Manager of Fixture Association

Artistic Lighting equipment dealers are occupying the front line trenches in an intense conflict for profits, Raymond J. Comyns told a large delegation of the Artistic Lighting Equipment Association at the midsummer meeting at Atlantic City, N. J., June 5-8. Mr. Comyns' address, entitled "Business is Business," followed an address by C. A. Bridges, president of A. L. E. A., and the report of Granville P. Rogers, retiring managing director. Following Mr. Comyns, Chas. L. Benjamin, the newly elected managing director spoke on some phases of advertising as it affects the lighting equipment industry. Mr. Benjamin is a man of long experience in advertising and merchandising. For several years he was editor of Printer's Ink in New York, and for many years has been an eminent advertising and merchandising authority in Chicago.

C. L. Benjamin

The address of Mr. Comyns of Alexander Hamilton Institute was one of the features of the Atlantic City meeting. Speaking of the relations between the lighting equipment dealers and the manufacturers, he stressed the necessity of close cooperation. Both the dealer and the manufacturer must awaken to the realization that this is truly an age of distribution, and that every effort to reduce distribution costs must be made. In a field in which there is such intense competition, he warned, there is danger that prices will be cut until there is little or no profit left.

Both Mr. Bridges and Mr. Comyns emphasized the necessity of actively supporting association work at this time. The association has made much progress up to this point, but now it has arrived at a crucial moment. To let down now is to lose the benefits of the work that has already been done. Now is the time to cooperate in an intensive effort to reduce distribution costs.

W. S. Andrews, Edison Pioneer, Dies at Age of 82

William Symes Andrews, a pioneer in the development of electricity and associate of Thomas A. Edison almost from the day the incandescent lamp was invented, died in Schenectady, N. Y., July 1, aged 82. He assisted in winding the armature of Edison's first dynamo, constructed the first Edison chemical electric meter, made the first molds for the carbonizing of lamp filaments and invented several delicate mechanisms necessary for the manufacture of light bulbs. He was continuously connected with the light, power and X-ray branches of the industry since 1879.

He entered the employ of Edison at Menlo Park in 1879. He was connected with the General Electric Company since 1881, and at his death was the oldest recognized employe of that company.

Uniform Refrigeration Code Adoption Is Urged

In the interest of national refrigeration safety code uniformity, the Refrigeration Division of the National Electrical Manufacturers Association, through its technical committee, urges the adoption of one code, preferably that of the American Standards Association, with an additional provision for multiple installation.

This committee, under the chairmanship of Glenn Muffly, Copeland Products, Inc., pointed out in a report made public during the Hot Springs meeting of Nema that the National Board of Fire Underwriters

Panel of Jewell Instruments in the plant of the Electric Controller and Manufacturing Company of Cleveland, used to test A. C. starters, compensators and controllers rated from 1 to 850 horsepower, 2300 volts.

Insure Your Products by Exacting Tests with Jewell Instruments

IN the plant of the Electric Controller and Manufacturing Company of Cleveland, accurate testing of apparatus is given every attention.

This is because most EC&M Control Apparatus for A. C. motors requires inspection but once in six months, and it must therefore be tested accurately. This concern is protecting their profits and the prestige of their apparatus by accurate testing with Jewell Instruments before shipment.

It pays every electrical manufacturer to carefully test every machine before shipment, because it saves money in the long run and builds prestige for his product as well. The inherent accuracy of Jewell instruments makes them the logical choice for this service.

Jewell engineers will gladly help you perfect testing equipment exactly suited to your requirements. Mail coupon for literature.

Jewell
Switchboard Instruments

The widespread popularity of Jewell Instruments is unquestionably due to the inherent reliability and accuracy of Jewell Movements, which are reflected in the clean-cut and legible scales.

Movement designs perfected through years of painstaking application to minute details; manufacturing processes of utmost precision; materials selected for their particular fitness without regard to cost; operators, who take pride in their skill, working in a clean, well-lighted plant; and critical inspections at every stage of manufacture, all contribute to the perfection of Jewell Instruments.

A critical comparison point by point with any other high grade instrument will demonstrate the superiority of Jewell Switchboard Instruments.

The Jewell Electrical Instrument Company makes a complete line of high grade A. C. and D. C. Instruments for every purpose, including switchboard instruments from 2" to 9" in diameter, and portable instruments from small pocket sizes to laboratory precision standards.

29 YEARS MAKING GOOD INSTRUMENTS

JEWELL

Switchboard Instruments

Jewell Electrical Instrument Company
1650 Walnut St., Chicago, Illinois

Please send catalog describing Jewell Portable and Switchboard Instruments.

Name .....

Address .....

has issued its own code covering multiple installation only, and is in process of drafting a more complete code. The committee has therefore suggested that Nema request the National Board of Fire Underwriters to cooperate with the American Standards Association in drafting and issuing an additional section of the A. S. A. code covering multiple installation; and that the former body, after the issuance of a complete A. S. A. code, substitute it for their own.

H. W. Wendt, Buffalo Forge Head, Passes Away

Henry W. Wendt, a leader in the heating and ventilating industry, and president of the Buffalo Forge Company, died after a short illness June 12, at his home in Buffalo, N. Y. He was almost 67 years of age. Practically all of his business life was spent in the business which he guided and which was established by his late brother, William F. Wendt, in 1878.

Henry W. Wendt

When he was only a youth he was placed in charge of the Buffalo Forge Company's manufacturing activities, where he frequently introduced new methods in the various departments. It was at Mr. Wendt's own suggestion that the Buffalo Forge Company engaged in the manufacture of fans and heating apparatus, and for some years he was the only salesman for fan equipment, as well as its designer and manufacturer.

Westinghouse Offers Night Welding Instruction

In order to satisfy the increased interest and demand for practical instruction in electric arc welding, the Westinghouse Electric and Manufacturing Company has launched a series of night classes in practical arc welding. The course is open to anyone desiring arc welding training who may be conveniently located for attending the school at East Pittsburgh, Pa. A small tuition fee is charged for the three months' course. Two groups of students, each meeting two nights a week for three hours each night, make up the classes. The enrollment is limited so that the students may receive individual attention and instruction at the hands of a competent arc welding instructor.

Similar classes are also conducted in the day welding school, where prospective buyers of arc welding equipment may attend free of charge.

Illuminating Engineers' Meeting to Be Held in Philadelphia

The 23rd annual convention of the Illuminating Engineering Society will be held at the Bellevue-Stratford Hotel, Philadelphia, Sept. 24-27, inclusive, according to an announcement from headquarters of the society, 29 West 39th St., New York City. Papers to be presented at the convention will constitute a summary of the progress made in the art and science of lighting during the past year.

One entire session of the Philadelphia meeting will be devoted to the observance of Light's Golden Jubilee, commemorating the 50th anniversary celebration of the invention of the incandescent lamp by Thomas A. Edison. Appropriate exercises and papers by well-known speakers will be featured. Other business sessions of particular interest to illuminating engineers will be held, including a session for central-station lighting service engineers, another devoted to natural lighting, and others featuring laboratory, lighting practice and technical subjects.

The entertainment program will include a visit to the beautiful Longwood estate of Pierre S. DuPont and a display of the electric fountain, which is said to be the most beautiful illuminated water display in the world. Other events of unusual interest in connection with the program will be announced shortly.

"Investigate Electric Heat" Wins $500 Award

In the industrial electric heat contest sponsored jointly by the National Electric Light Association and the National Electrical Manufacturers Association, "Investigate Electric Heat" was the slogan chosen from some 800 entries for the first prize of $500. It was submitted by W. H. Steinhauer, engineering department, Toledo Edison Company, Toledo, Ohio. Submittals in the contest were judged by a committee consisting of R. T. Kaighin, G. W. Tall, Jr., and F. M. Feiker, representing the National Electric Light Association, National Electrical Manufacturers Association and the Associated Business Papers, Inc., respectively.

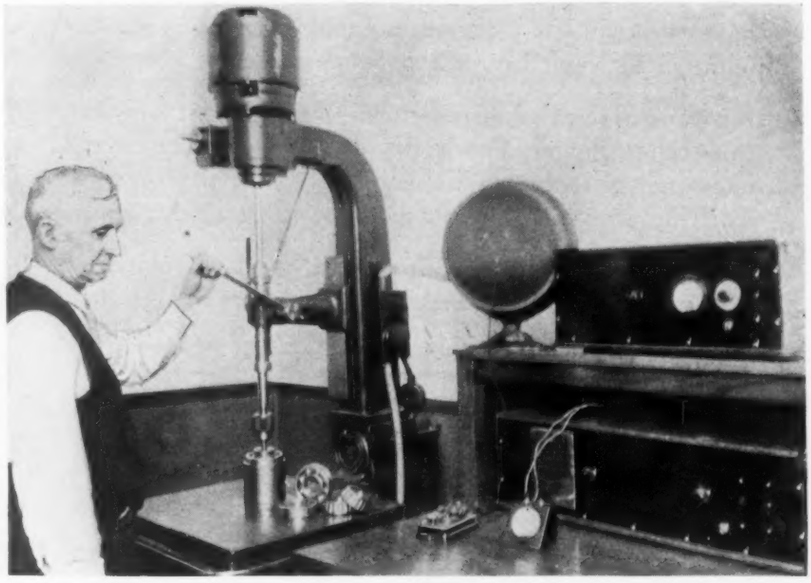
Second prize of $100 went to C. H. Pfingsthorn, 106 W. Lincoln Ave., Mt. Vernon, N. Y., who submitted "'Switch' to Perfection with Electric Heat." Third prize of $50 was awarded to E. A. Heath, 211 E. First St., Fond Du Lac, Wis., for his slogan, "Electric Heat is Cheaper Than Rejects." Four other prizes, each of $25 were presented for the following: "Use Electric Heat If You Want to Compete," by Mary K. Freeman, Larchmont, N. Y.; "Heat Electrically—It Makes Good Products Better," J. J. Barry, Boston, Mass.; "Electric Heat—the Production Heat with Laboratory Precision," H. R. Houghton, Baltimore, Md.; "Safeguard Quality and Lower Costs with Electric Heat," Hazelton Newton, Schenectady, N. Y.

C. F. Brush, Arc Light Inventor, Dies in Cleveland

A complication of bronchitis which developed into pneumonia combined with his old age, caused the death of Charles F. Brush in Cleveland, Ohio, June 15, at the age of 81. One of the last notable acts of Mr. Brush, inventor of the arc light, scientist, humanitarian and philanthropist, was the establishment of the Charles F. Brush Foundation for the Betterment of the Human Race. He donated $500,000 for this purpose, and only recently trustees announced plans for carrying on this work. Until his last illness Mr. Brush was very active.

Mr. Brush was born in Euclid Town-

Radio Tests Motor Bearing Structure



RADIO apparatus which measures and records sound waves is employed to test roller bearings in a Los Angeles factory. Each bearing is tested against a fixed standard for maximum sound volume while operating under heavy load. Flaws in the structure of a roller bearing produce sounds closely resembling radio static

CHROMIUM

—as 5th Avenue displays it..

FURNITURE, decorations, electrical devices, lighting fixtures, personal items by the thousand — all Chromium Plated—are on display in dozens of shops on the avenue.

It is the utility of "U. C." Chromium Plate that has brought it from a laboratory curiosity into national demand. 5th Avenue is asking for more and more Chromium Plated merchandise. The progressive manufacturer and the most famous designers are cooperating.

United Chromium, Inc. is playing an important part, too. It renders a valuable licensing service which assures manufacturers of Chromium Plating on a definite production basis. It relieves them of uncertainty; guards them against failure and the losses due to rejects . . . The service includes the supervision of new plant installations; coaching of platers and control and maintenance of solutions by periodic tests.

It would be a pleasure to send details of our licensing service to manufacturers who contemplate using Chromium Plate on some of their products. Names of our jobbing licensees will be gladly sent to those whose present needs do not justify their own plating department.

Photographs by courtesy of Lord & Taylor, New York

UNITED CHROMIUM
INCORPORATED

Executive Office: 51 East 42nd Street, New York City

Chicago, Ill. ◆ *Cleveland, O.*

Detroit, Mich. ◆ *San Francisco, Calif.* ◆ *Waterbury, Conn.*

ship, Cayuga County, Ohio, on March 17, 1849. He graduated from the University of Michigan in 1869 with the degree Mechanical Engineer, a full year ahead of his class. His early career found him in professional chemistry for a while and later in the purchase and sale of iron.

In 1875 he perceived the usefulness of a first-rate dynamo, and dropping everything else, within a few months had constructed one which holds its own to this day. There was, until that time, no lamp suitable to use the power of the dynamo, and as a result there was created the Brush lamp. He made many other inventions, such as the fundamental storage battery as well as devices for arc lamps and dynamos.

Westinghouse Elects Merrick New President

Directors of the Westinghouse Electric and Manufacturing Company have elected Frank A. Merrick president, to succeed E. M. Herr, who held the position since 1911, according to an announcement by A. W. Robertson, chairman of the board. Mr. Herr was named vice-chairman of the board.

F. A. Merrick

Mr. Merrick, formerly vice-president and general manager of the company, is a native of New Jersey and received his technical training at Lehigh University. Shortly after leaving college, he became associated with the Lorain Steel Company where he made several electrical inventions and was manager and chief engineer. Subsequently the Lorain firm was taken over by Westinghouse and Mr. Merrick joined the latter. He was connected with Canadian Westinghouse Company, Ltd., for a number of years. During the war he was identified with American operations in the manufacture of guns and ammunition.

He was appointed vice-president and general manager of Westinghouse Electric and Manufacturing Company in 1925.

Mechanical Engineers Prepare for Golden Anniversary

Ceremonies which will be international in scope and which will record the achievements of the American Society of Mechanical Engineers for the past fifty years will be held from April 5-9 of next year, in celebration of the organization's Golden Anniversary. In February and April of 1880, two meetings were conducted which resulted in the formation of the A. S. M. E., and in 1930 the influence of mechanical engineering upon the social and economic life of the country will be evaluated, and the developments which appear likely in the near future will be discussed.

Invitations have been issued to engineering societies and schools throughout the world to send delegates to the meetings.

Eisler Electric Corporation Plans Expansion

Owing to the tremendous growth and large expansion program in view, says a statement from the Eisler Engineering Co., Inc., the company has become a public stock issue, and in the future will be known as the Eisler Electric Corporation. The management of this new organization will remain intact, and continue under the personal supervision of Charles Eisler.

Charles Eisler

The Eisler Electric Corporation, located at 740-742 S. Thirteenth St., Newark, N. J., will continue its consulting engineering service, besides its manufacture of a line of neon, radio tube and incandescent lamp machinery and oil burners.

Manufacturers' Conference Report Is Available

The Metropolitan Life Insurance Company, 1 Madison Ave., New York City, has announced the publication of a complete report of the First Annual Southern Manufacturers' Sales Conference, held at Atlanta, Ga., Nov. 22, 1928. The report includes a number of addresses and discussions, most of which are of interest to all manufacturers. Copies of all reports may be obtained free of charge on application to the Policyholders' Service Bureau, Metropolitan Life Insurance Company.

Among the subjects of particular interest to electrical manufacturers are the following: Opening remarks by the chairman, Preston K. Arkwright, president, Georgia Power Company; Studying Consumers' Buying Habits, Raymond A. Kline, vice-president, Davison-Paxton Company, Atlanta, Ga.; Utilizing Salesmen's Time More Efficiently, C. E. Shaw, manager of sales research, Dennison Manufacturing Company, Framingham, Mass.; Organizing for Style and Design, Paul Bonner, vice-president, Stehli Silks Corporation, New York City.

Leonard Refrigerator Co., Grand Rapids, Mich., has appointed Holt Hollinger manager of advertising and sales promotion, to succeed Earl Lines, who recently became advertising and sales promotion director for the Kelvinator Sales Corporation, Detroit. Mr. Hollinger was advertising and sales promotion head of the Battle Creek Food Co., for the past five years.

Colin B. Kennedy Corporation, South Bend, Ind., announces the following additions to its personnel: E. W. Kennard, formerly sales manager of the Sunset Electric Co., Seattle, Wash., now Kennedy Pacific Coast manager; Alfred P. Sirois, formerly with A. A. Gray & Co., advertising agency, now Kennedy advertising manager; R. P. Cawley, for the past five years with Crosley Radio, prior to which he was with the Kennedy organization, has rejoined the latter and will cover his old territory, the Kansas City district; William B. Nevin, from 1921-1922 Kennedy sales and advertising manager, and until recently with the Sterling Manufacturing Co. in a similar capacity, has rejoined Kennedy as general sales manager.

Steinite Radio Co., Chicago, has made arrangements whereby it will be able to supply its own tubes for radio sets manufactured by the company, announces Leslie M. Muter, vice-president. All tubes will be tested and certified by Steinite engineers, thus assuring maximum performance for Steinite receivers.

Pilot Radio & Tube Corporation, 323 Berry St. Brooklyn, N. Y., has taken over the Pilot Electric Manufacturing Co., Inc., of the same address. The business will continue under the same management. The company announces the appointment of David Grimes as chief research engineer.

National Electric Products Corporation, Pittsburgh, Pa., has prepared an interesting guide for the ordering of National flexible lamp cords. The guide, known as the National color card, contains samples of 28 different colored cords, each labeled by color and at the same time by number.

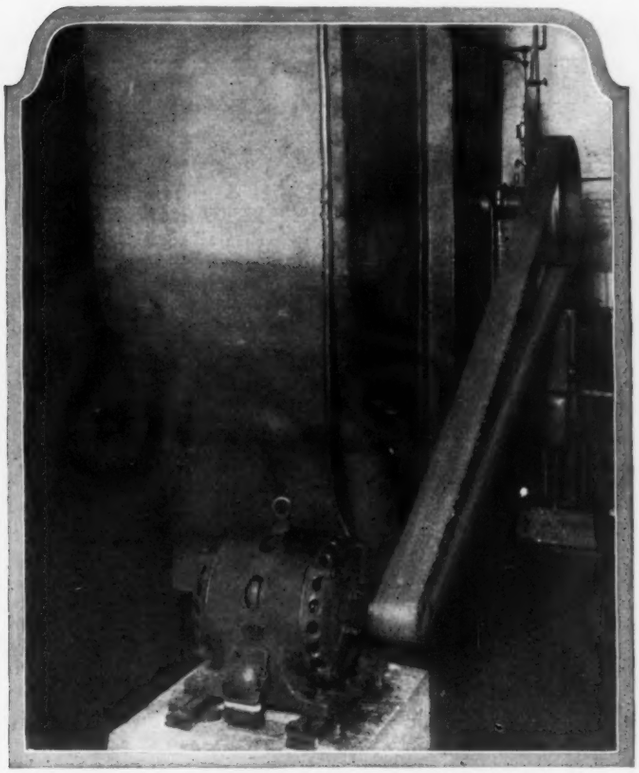
Edwin L. Wiegand Co., 422 First Ave., Pittsburgh, Pa., has appointed J. V. Calhoun eastern sales and engineering representative. His offices are located at 800 Commercial Trust Bldg., Philadelphia, Pa. He covers the territory comprising Philadelphia district, up to New York, Delaware, Maryland and New Jersey.

Despatch Oven Co., 622 Ninth St., Minneapolis, Minn., has named the Industrial Engineering & Equipment Co., 1431 Syndicate Trust Bldg., St. Louis, as district sales representative in the Southern Illinois and Central Missouri territory, for the complete line of Despatch industrial ovens.

Allen-Bradley Co., Milwaukee, Wis., has appointed F. L. Reynolds district representative for the company's electric controlling apparatus in the West Michigan territory, with headquarters at 4143 Ellsworth Ave., Grand Rapids, Mich.

Copeland Products, Inc., Detroit, reports net earnings for the first five months of 1929 of $242,477.41, after taxes, depreciation and the setting aside of liberal reserves. This is an increase of more than 33 per cent over the same period of 1928.

General Electric Co., Schenectady, N. Y., has appointed as sales manager of the radio department, Frank R. Deakins, assistant in charge of sales. He joined General Electric in 1915 as a member of the testing department and later was named contact man at Washington with the bureau of aeronautics

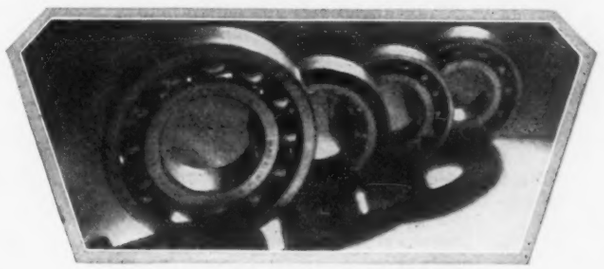


A Signal of Progress

The Century Motor shown is equipped with New Departure Ball Bearings — true sentinels, on guard against waste, wear and trouble. Good closures prevent waste, good design prevents wear and good performance prevents trouble. Grease replenishment is necessary but once a year. It's a true signal of progress — a sign of economy-wise management when New Departures are specified in motor equipment.

Have you read our Booklets "K" and "Cutting Your Costs"? Ten minutes so spent may save you many motor dollars.

The New Departure Manufacturing Company, Bristol Connecticut; Detroit, Chicago, San Francisco, and London, Eng.



NEW DEPARTURE

1252

BALL BEARINGS

and the army and navy aircraft radio departments.

Time-O-Stat Controls Co., Elkhart, Ind., manufacturer of automatic controls, has appointed Henry S. Wright of Chicago, vice-president and assistant general manager of the company. J. C. Henry, associated with the Cities Service utilities for a number of years has been named to act as central station contact man for the Time-O-Stat Controls Co. in the Mid West and Western States.

Syracuse Washing Machine Corporation has acquired a subsidiary company of the Splitdorf Bethlehem Electrical Corporation manufacturing the Rol-Iron ironing machine. Manufacturing operations are being transferred from Detroit to Syracuse, N. Y. Output has been increased to 350 machines per month, which is between 50 and 100 greater than previously.

Eastern Cabinet Co., 34 University Pl., New York, N. Y., is the name of a new manufacturer of radio furniture, organized by Alfred J. Shaw, formerly of M. Teicher & Sons, Inc.

Westinghouse Electric & Manufacturing Company announces that at a recent meeting of the board of directors J. S. Tritle, in charge of the company's manufacturing operations, was elected a vice-president. He managed the Westinghouse Kansas City and St. Louis district sales offices for a number of years, and in 1922 was made head of the merchandising department. In 1925 he assumed full charge of the engineering and manufacturing as well as sales work of the merchandising division, and on May 1 of this year was placed in charge of manufacturing operations.

Pass & Seymour, Inc., Solvay Station, Syracuse, N. Y., has moved its Chicago office, warehouse and showroom to 605 W. Washington St., Chicago.

U. S. Chromium Corporation has changed its address from Park Building, Pittsburgh, Pa., to Pitt and Wallace Sts., Wilkingsburg, Pa.

Sundh Electric Company, Inc., Newark, N. J., has appointed Gordon H. Gildersleeve as representative in the Northern Ohio territory. Frank O. Wallene, formerly in charge of this district, will devote all his time to his engineering work.

Acme Electric Heating Company, 1217 Washington St., Boston, Mass., manufacturer of electrical heating appliances for mechanical, industrial and domestic use, has moved its New York office from 28 Warren St. to 126 Liberty St., New York City.

Lincoln Electric Company, Cleveland, Ohio, manufacturer of "Stable-Arc" welders and "LincWeld" motors, announces the appointment of new district sales representatives. B. W. Brown has been advanced to district sales representative with headquarters at Milwaukee, Wis. G. O. Forseth, formerly sales representative at Detroit, has been promoted to district sales representative with headquarters at Minneapolis, Minn.

Coming Conventions

American Institute of Electrical Engineers.—Pacific Coast convention, Los Angeles, Cal., Sept. 3-8.

American Manufacturers' Association.—Meeting in New York City, Sept. 3.

American Society of Mechanical Engineers.—Third national meeting of the Iron and Steel Division during the Steel Treaters' Convention, Cleveland, Ohio, Sept. 11-13. Third national fuels meeting at the Bellevue-Stratford Hotel, Philadelphia, Pa., Oct. 7-10.

Chattanooga Power and Mechanical Exposition, in conjunction with 47th Convention of the National Association of Power Engineers, Chattanooga, Tenn., Sept. 9-13, inc. Frank N. Chapman, care of A. Leschen & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo., secretary of the National Exhibitors' Association.

National Association of Power Engineers.—47th Annual Convention, Chattanooga, Tenn., Sept. 9-13, inc. The Power and Mechanical Exhibition will be conducted in conjunction with the convention. Ivon F. Pieters, president, Plibrico Jointless Firebrick Company, 1800 Kingsbury St., Chicago, Ill. S. M. Chapman, secretary, 5909 Kennerly Ave., St. Louis, Mo.

Manufacturers' Catalogs

General Electric Co., Schenectady, N. Y. Bulletin GEA-1116, supersedes No. 45300A, current-limiting reactors.

Kodel Electric & Manufacturing Co., Cincinnati, Ohio. Engineering bulletin 3678 technical data and general information on the "Kuprox" line of rectifiers for operating time clock signal and recording systems, battery charging rectifiers, power rectifiers for telephone and telegraph service, etc.

Wagner Electric Corporation, St. Louis, Mo. Bulletin 151, third revision, containing a discussion of dust, fume and moisture problems requiring special protection for motor and property. The publication points out these construction features making Wagner air-jacketed motors dust-proof, fume-proof and moisture-proof.

Eisler Electric Corporation, 740-772 S. Thirteenth St., Newark, N. J. Catalog "P," oil sealed high vacuum pumps, single-stage and compound two-stage types. This catalog includes a two-page spread picturing manufacturing operations in the Eisler plants; a discussion of the uses and advantages to be derived from Eisler pumps, and sixteen pages containing specifications for the company's products, profusely illustrated.

Obituary

H. P. Martin, senior member of the firm of H. P. Martin & Sons, Owensboro, Ky., manufacturer of portable vise stands and pipe benders, died at his home in that city on June 20, at the age of 89. He emigrated to this country from Germany in 1852 and was located in Louisville, Ky., until 1881. He was associated with the Owensboro Water Works Company for 25 years, when he resigned to organize his own company of H. P. Martin & Sons. In 1915 he invented the portable vise stand and pipe bender, now in universal use throughout North America.

Oliver Ames, senior member of the board of directors of the General Electric Company, died at his home in North Easton, Mass., June 18, aged 65. He was a member of the board since 1893.

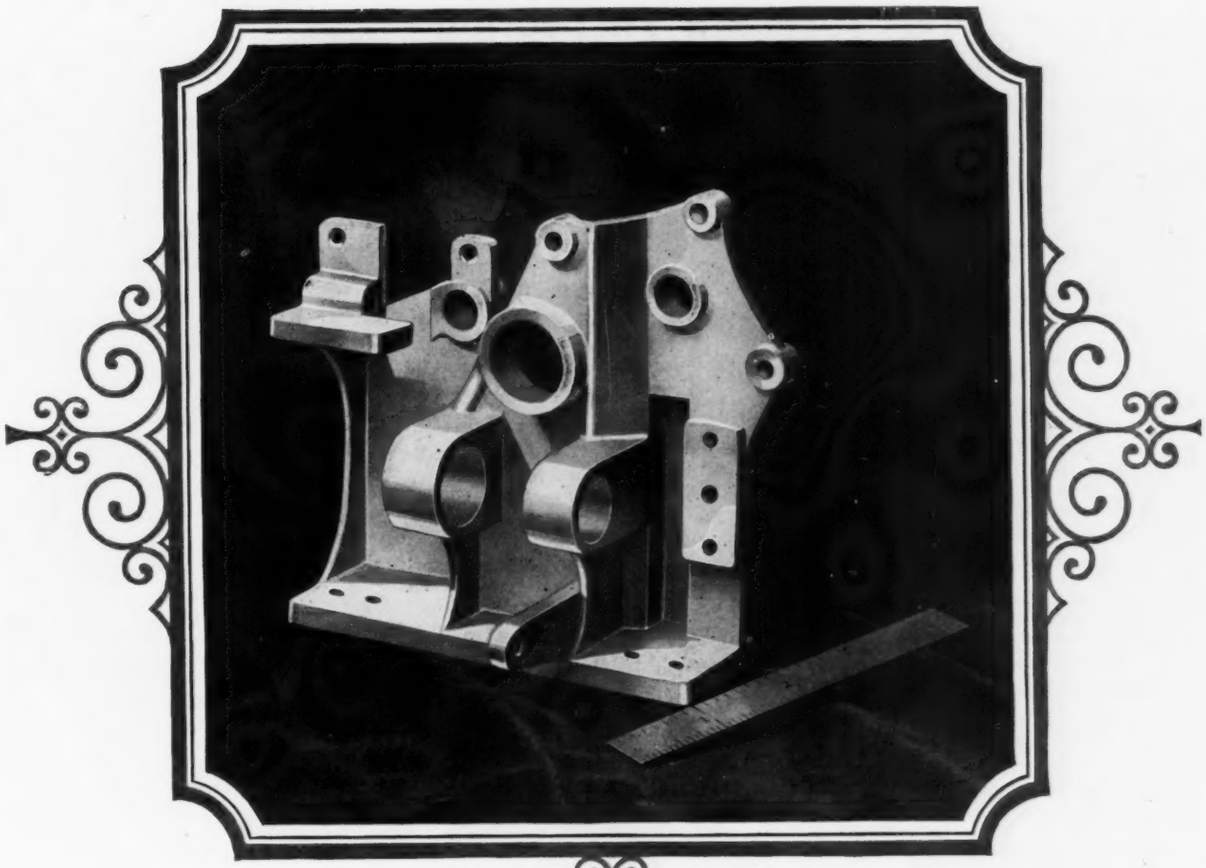
Information Wanted

We have been asked for the names and addresses of manufacturers of the articles listed herewith.

Replies from our readers to any of these inquiries will be greatly appreciated by the Information Bureau of Electrical Manufacturing, 461 Eighth Avenue, New York City.

"Parker" Canopy Insulator.
"Trio Dynamik" Radio Receiving Sets.
"Reliance Knight" Lamps.
"Burrows" Therapeutic Lamp.
"L. R. Co." Receptacles.
"Williams" Commutator Dressing.
"Splendida" Electric Iron.
"Graustark" Line of Lighting Fixtures.
"Sal Co. 176" Lamps.
"Electron" Heating Pad.
"Lilly Wilson" Vacuum Cleaner.
"Perkins" Siren.
"Flint" Waffle Iron.
"Pioneer" House Pump.
"Blaisdell" Automatic Electric Cigar Lighter.
Columbus-Universal" Electric Vacuum Cleaner and Floor Polisher.
"Defiance" Cigarette Lighter.
"Hillcrest" Line of Lighting Fixtures.
"Vesodore" Cigar Lighter.
Manufacturers of Electric Incinerators.
Manufacturers of Electric-driven lamp-shade lacing machines.
Steel Collapsible Barrels used for post hole digging.

"Dot" Grip Cable Hangers asked for in our June issue can be obtained from C. S. Merrick & Co., 60 State St., New Haven, Conn.



Distinctive Differences

To the veteran user of the products of the die caster's art, the refinements in Newton Castings are vividly real —the perfection of the dies, the mastery in alloying metals, the care in the making of each casting, the thoroughness in inspection—

All these sum up to define that quality which commands a growing preference—

Newton Service, indicative of judgment and experience, is likewise gaining in preference.

NDC 16

The NEWTON DIE CASTING Corp'n.

146 Munson St. NEWTON NEW HAVEN New Haven, Conn.

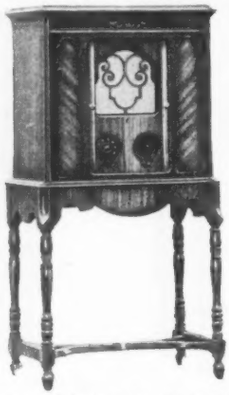
New Goods for Your Inspection

Resistograd Variable Resistor

Pilot Elec. Mfg. Co., 323 Berry St., Brooklyn, N. Y., announces its Resistograd, a variable resistor of the compression type, with a resistance range from 40 to about 10,000,000 ohms. It will handle 20 watts of power, and is thus used especially on radio receivers. It is non-inductive, and will steadily maintain the resistance value to which it is set by any adjustment of the knob. The change from minimum to maximum resistance is made through four turns of the knob. This resistor will operate on 500 volts without internal sparking. It is 2 7/16 in. long overall and 1 7/16 in. in diameter, and mounts in a single hole. A black Bakelite adjusting knob is provided.

Ebert Radio Cabinets

Ebert Furniture Co., Red Lion, Pa., announces Ebert radio cabinets Models No. 70 and 71. These cabinets are made of five-ply American and African walnut veneers with tenon groove and glue-block



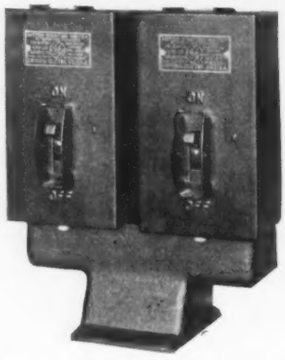
construction. Model No. 70 is 52 in. high, 27 in. wide and 17 in. deep, with a set compartment space of 23 in. x 13½ in. x 9 in. Model No. 71 (illustrated) measures the same as Model No. 70. Special panels will be cut for all types of sets where the set controls do not exceed 10¼ in. in width.

Commutator Compound

Withington Division of the Marnot Co., 50 Thayer St., Boston, is marketing a commutator compound known as Commutator Companion. This compound is said to stop sparking, heating, scoring and chattering, and is said to permit greater overload and insure quiet running. The manufacturer states that it will not short circuit the bars of the commutator and will not collect dust or dirt. It contains no grease, grit or harmful ingredients. It is said to form an invisible and highly conductive film on the commutator; a film that acts as a lubricant. It is packed in a cold vulcanized rubber container, which also acts as an insulator, making it possible to apply the compound to the moving commutator without danger of burning the fingers. One application of the compound lasts from two to six months.

Across the Line Starter

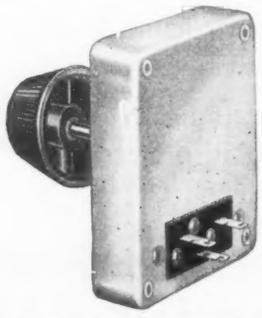
General Electric Company, Schenectady, N. Y., offers the trade a manual starting switch for throwing motors across the line. The switch bears the designation CR-1038-E-1 and has a maximum rating of 1 hp. at 110 volts and 2 hp. at 220 to 600 volts, 3 phase. The device consists of a tumbler switch and two small thermal cutouts mounted on a common textolite base by means of suitable interlocks; the switch can be locked in either the open or closed



position. The manufacturer calls attention to the particular value of this switch in the textile industry, in that through its application is the optional use of either double or single pedestals on which the switch can be mounted in positions near the machines. The links, contact, spring and post are made of tinned copper to prevent oxidation.

Variable Resistance

Electrad, Inc., 173 Varick St., New York, announces a five-watt, high-resistance volume control. It is of all metal construc-



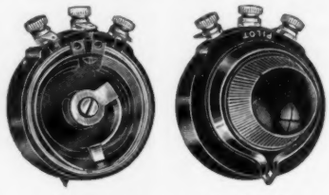
tion, and has resistance elements of graphite, fused to an enamel base. It is available in any desired range. The resistance curve can be either of uniform resistance variation or tapered, according to specification. The resistance contact is made of pure silver. Resistance is said to remain constant.

Cold Rolled Strip Steel

Thomas Steel Co., Warren, Ohio, has placed on the market a cold rolled strip steel with an electro zinc coating. The manufacturer states that this material is highly desirable from the rust resisting standpoint, and can be drawn and formed without cracking or peeling the zinc coating. The coating is also said to give a bright, smooth finish.

Volumgrad Variable Resistor

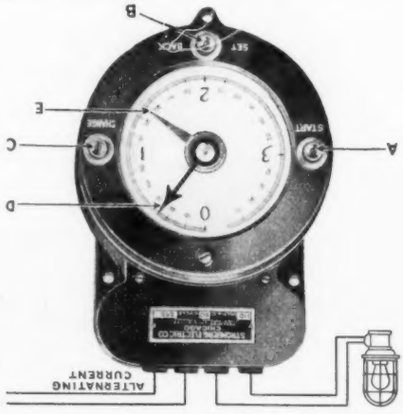
Pilot Radio & Tube Corp., 323 Berry St., Brooklyn, N. Y., has placed on the market the Volumgrad variable resistor designed for use as a volume control in radio receivers. This device is made in



four resistance ranges: 0—50,000 ohms, 0—100,000 ohms, 0—200,000 ohms, and 0—500,000 ohms. The resistor causes a variation of its full value with one full turn of the knob. It is housed in a one-piece case of molded bakelite 2 in. in diameter and 23/32 in. thick. The resistance element is a strip of non-hygroscopic material impregnated. It is coiled inside the case, and contact to its surface is made by a flexible phosphor-bronze ring slightly smaller in diameter than the resistance ring itself. A button attached to a rotating arm presses a small section of the ring against the strip, making a good electrical connection with it. This method of operation relieves the resistance strip of wear.

Process Timing Instrument

Stromberg Electric Co., 223 W. Erie St., Chicago, has brought out Model No. 55 process timing and signalling instrument,



which automatically makes electrical contact at the ends of predetermined time intervals for which it is set and controls any desired apparatus. At any time during the process the dial shows the exact length of time elapsed and how much longer the process has to run. The manufacturer states that this instrument may be used in controlling heat-treating furnaces, starting and stopping motors, etc.

Six pieces of a vending machine assembly
DIE CAST BY STEWART

Stewart Die Casting Service

Stewart Die Casting Service is based upon a number of exclusive developments in die casting, and upon the complete facilities—men, methods and machines—of the largest plant in the world devoted exclusively to die casting.

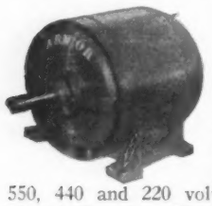
Manufacturers who wish to secure every possible advantage with which to meet present-day competition will find Stewart Die Casting service of unusual value. Stewart engineers will submit definite information on die castings to meet your requirements upon receipt of blueprints or samples of your present production.

THE STEWART DIE CASTING CORPORATION
4500 Fullerton Avenue
Chicago :: Illinois
Detroit Pittsburgh Milwaukee Dayton
St. Louis New York City Cleveland

Stewart

EM 7-Gray

Armor Totally Enclosed Motors



Armor Electric Mfg. Co., Erie, Pa., has developed a line of explosion and abrasion proof, totally enclosed motors in ratings of ½ to 50 hp., 550, 440 and 220 volts, 2 and 3 phase, 25 and 60 cycles. These motors, which are Timken equipped, are of the squirrel cage induction type and are particularly suitable for use where the atmosphere carries explosive fumes or abrasive dusts such as in chemical plants, coal mines, foundries or cement plants. The stator is of the skeleton frame type, the frames being made of heavy castings, with the feet cast integral. The core is made up of high silica steel laminations, keyed to the stator ribs and having partially closed slots. The windings are of the concentric type, with one phase per slot. All end coils are completely taped, and the whole stator is impregnated with a moisture and acid resisting compound.

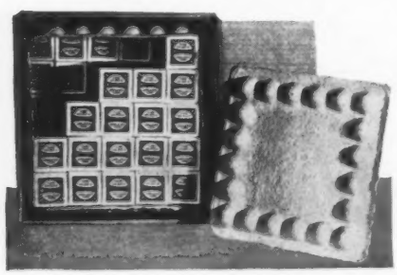
Rectifier

B-L Electric Mfg. Co., 19th and Washington Aves., St. Louis, is marketing a rectifier designed especially for use in the manufacture of dynamic speakers and a

rectifier assembly for use in the operation of time clock systems and similar appliances. This Type B-12 S-5 rectifier assembly eliminates the use of battery and is built into a metal box.

Radio Tube Packing

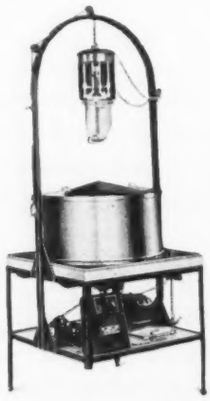
Holed-Tite Packing, Inc., 100 E. 42nd St., New York, announces the Holed-Tite moulded pulp pad for protecting radio



tubes boxed for shipment. The accompanying illustration shows this method of packing the standard 50 tube radio case, one pad being used on each side of the box. The indentations are on the outside edges of the pads which provides the maximum cushioning surface to give the desired elasticity in absorbing jolts and shocks. These pads are used in place of other interior packing, such as excelsior, corrugated fillers, or inside cartons. The manufacturer states that the use of these pads helps to speed up the packing of tubes and reduces the weight and size of the carton. Pads for the packing of the large power tubes will be introduced in the near future. Moulded pulp pads are, of course, applicable for packing other fragile products.

Weathering Test Machine

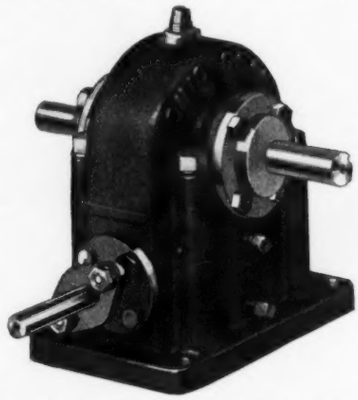
Atlas Electric Devices Co., 360 W. Superior St., Chicago, has placed on the market the Weather-Ometer, a convenient laboratory device by which a research chemist can obtain an accelerated weathering test on such protective coatings as paints, varnishes, lacquers and bitumens. Light, moisture, temperature changes and varying small incidental additions to normal air are the important causes of decay of paints, varnishes and other organic protective coatings. The exposure cylinder of this device is provided with water sprays, so that it is possible to expose the panels in succession to intense light and to a variety of moisture conditions. A pan placed about 2 cm. below the bottom of the cylinder contains water and serves to keep the temperatuure down to abount 52° C. next to the panels, as well as to humidify the air. A separate



cabinet for exposure to refrigeration can be provided. All electrical circuits terminate in a metal cabinet mounted beside the water controls. The electrical equipment consists of a voltmeter for the arc lamp circuit, 30-amp. rotary switch and a 4-point control switch to vary the resistance in the arc circuit, so as to maintain the proper arc voltage regardless of the rise and fall of potential in the main line. Fuse blocks with enclosed fuses are also provided for the arc and motor circuits. The specimen cabinet in which the finishes are tested is provided with holders so that as many as 60 panels may be tested at the same time. These holders are so constructed that the operator can remove two specimens at a time for examination without touching the surface of the coating. Various sizes are available for different weathering tests.

Ohio Speed Reducers

Ohio Gear Company, 1333 East 179th St., Cleveland, announces Models No. 0, 1, 2 and 3 Ohio speed reducers equipped



throughout with Timken roller bearings. The worms are hardened and have the threads ground and when working with phosphor bronze worm wheels with which these reducers are equipped, they give the smoothest possible bearing. These speed reducers are available in various ratios from 6¾ to 1, to 100 to 1. Special ratio reducers will be made up from stock parts on order.

Dust-Tight Enclosures

Cutler-Hammer, Inc., 124-12th St., Milwaukee, has placed on the market dust-tight enclosing cases for its across-the-line automatic starters. These enclosures are built in two types, one for motors up to 5 hp. in which the case is of cast iron, and one for larger sizes in which the case is made of heavy welded boiler plate. They are provided with a soft rubber gasket between the cover and case. Eye bolts with wing nuts at the sides hold the cover in place. In addition to being dust-tight, the small cast iron enclosure is also

weatherproof. It has the start, stop and reset buttons mounted directly in the cover. The larger sizes have the reset button only in the cover and a separate dust-tight push button station provides remote control. These enclosures will not replace the standard dust-proof enclosures, but are offered as an option for installation in mines, woodworking plants, cement mills, flour mills, pulverizing plants and other similar industries.

An electrical control problem

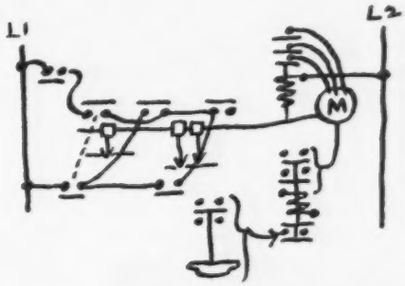
that of full-automatic action of the screen pots in a sewage disposal plant .....

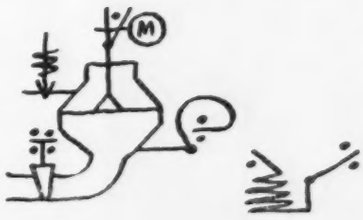
our engineers produced *these sketches*

This is one of hundreds of control problems that Sundh has solved for manufacturers of electrical apparatus.

In this instance the job called for the full-automatic control of two screen pots discharging each when it becomes full and resetting after the discharge. The problem was to *allow only one pot to discharge at time, holding up the other until the first had been completely reset.* Sundh licked that problem with absolute finality.

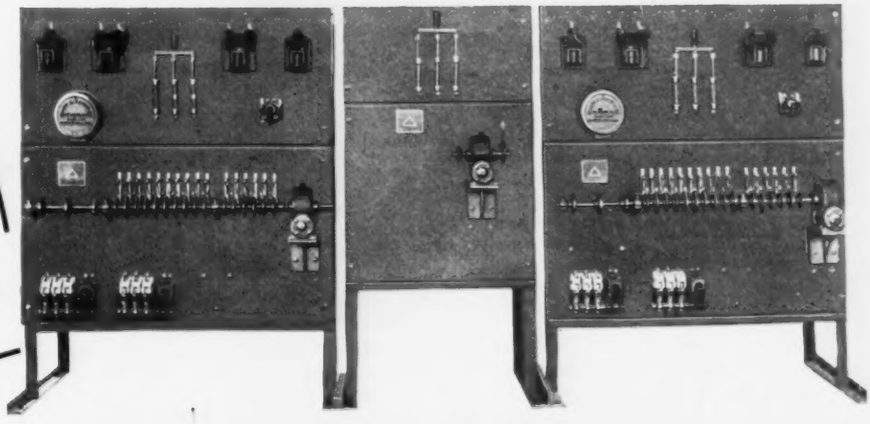
The SUNDH organization works at nothing but the accurate and simplified methods of electrical control. What this organization has done—and is doing—has the endorsement of concerns whose names mean much in the electrical industry.





and here's the answer!

This was an unusual problem. Perhaps yours is also. Let us see what can be done with it.



SUNDH ELECTRIC COMPANY, INC.

Parkhurst Street at Avenue C, Newark, N. J.

SUNDH

Representatives:

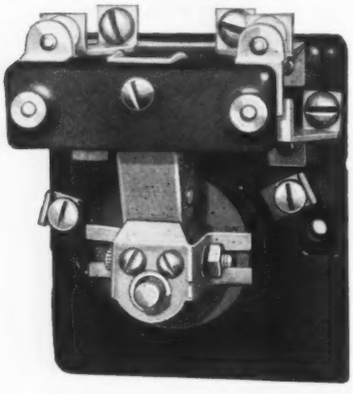
BIRMINGHAM, J. W. Eshelman, 1220 American Traders Bank Building.
BOSTON, A. H. Abbott, 88 Broad Street.
BUFFALO, W. T. Quimby, 1010 Morgan Bldg.
CHICAGO, Thos. E. Beasley, 333 N. Michigan Ave.
CINCINNATI, R. M. Heim, 2413 Union Central Bldg.
CLEVELAND, Gordon H. Gildersleeve, 439 Terminal Tower Bldg.
DENVER, Joy & Cox, Inc. 314 Tramway Bldg.
DETROIT, R. D. Ernest, 1420 David Stott Bldg.
LOS ANGELES, Otto Demmert, 106 W. Third Street.
MINNEAPOLIS, H. R. Harris, 708 6th Avenue, South.
NEWARK, L. L. Wilcox, Parkhurst St. at Avenue C.
NEW ORLEANS, L. C. Reed, 1230 Hibernia Bank Bldg.
NEW YORK CITY, P. W. Moeller, 51 E. 42nd St.
PHILADELPHIA, H. F. Darby, Jr., 1700 Walnut Street.
PITTSBURGH, Rutherfoord & Uptegraff, Clark Bldg.
ST. LOUIS, D. O. Stewart 619 Bank of Commerce Bldg.
SAN FRANCISCO, Utilities Equipment Corp., 1644-A Russ Bldg.
SEATTLE, Thomas S. Wood, 505 Polson Bldg.
VANCOUVER, B. C., Phillips-Henderson Co. 560 Beatty St. (Bekins Bldg.)

Pyrometer

Roller - Smith Co., 233 Broadway, New York, announces the Type FD, 4-in. pyrometer. The pyrometer is furnished with a thermocouple and leads. The specific application of the device is in indicating the temperature of molten type metal as used with various kinds of type casting machines. The manufacturer points out the following advantages for this pyrometer as contrasted to the thermometer method of reading temperature. Readings can be taken from any position and from considerable distances. The instrument is not damaged by abnormal temperatures. The range of the instrument is 0—1200 deg. F.

A. C. Contactors

Allen-Bradley Co., 494 Reed St., Milwaukee, announces a line of small A. C. contactors for electric ranges, water heaters,



steam vulcanizers, fire alarms, oil burners, refrigerators, traffic signal systems and other applications requiring an automatic control switch of small capacity. These contactors, known as Bulletin 701, are provided with silver double-break contacts, and the entire assembly is mounted on a molded bakelite base. All switch parts are cadmium plated to prevent corrosion. They can be provided for operation on 6, 12, 24, 110 or 220 volts for any frequency from 25 to 60 cycles. Current ratings range from 15 to 30 amp. Two or three-wire control can be used with any type of pilot control device. These contactors can be provided with steel enclosing cabinets if desired.

Glyptal Insulating Lacquers

General Electric Co., Schenectady, N. Y., announces a line of insulating and protecting lacquers for use in painting motors, tanks, pipe joints, mine machinery and similar equipment requiring sealing and insulating paints. This series of lacquers is supplied in colors and can be used anywhere that oil-resistant, highly protective, durable and flexible insulating coatings are needed. The base of these lacquers is alkyd resin, produced from phthalic anhydride and glycerine, and is to be marketed under the name of Glyptal. These paints possess many desirable qualities, including resistance to acids, mineral oils, weather, alkalies, tenacious adhesion to any surface, and protection against rust.

Wagner Rubber Mounted Motor

Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo., announces Model RAR motor in which the motor proper is

completely insulated from the supporting cradle-shaped base by means of rubber bushings. This is said to make the motor exceptionally quiet in operation and, therefore, ideally suited to the needs of appliances operating in homes, schools, churches and other places where motor noise is objectionable. The motor is of the brush-lifting type, the brushes being lifted off the commutator as soon as the rotor attains operating speed. The governor weights are equipped with rubber bumpers and the rocker arm has been redesigned to practically eliminate brush noise during starting and stopping. The manufacturer states that the power factor and efficiency are considerably better than the NEMA requirements, due to better distribution of material. This motor is available in 1/6, ¼ and ⅓ hp. sizes.

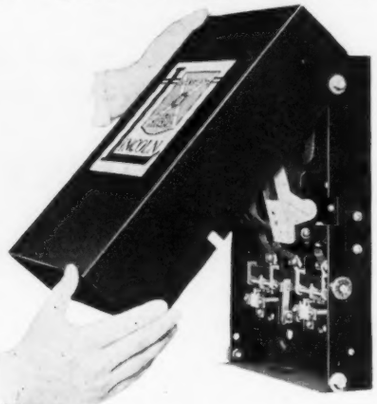
Ajax Flexible Coupling

Ajax Flexible Coupling Co., Westfield, N. Y., has brought out type "C" Ajax flexible coupling which consists of two die

cast flanges of identical diameter with wide faces and with all surfaces made true with the bore. Connection of the two flanges is made by four set screws which are screwed through the flanges into four nuts molded firmly into the rubber centerpiece. This coupling is designed to efficiently absorb shocks, provide end float and protect the bearings of both driving and driven machines. These couplings are available in ⅛, ¼ and ⅓ hp. per 100 r.p.m. sizes. The manufacturer states that these couplings are being used on small pumps, blowers, fans, speed reducers and on appliances and small process machines using small motors.

Across the Line Starter

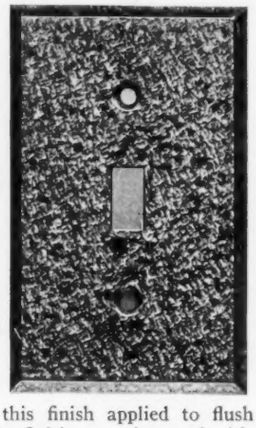
Lincoln Electric Co., Cleveland, has brought out an improved across-the-line motor starter controlled by the new Lincoln safety push button which is a standard equipment with this starter. Ease of installation, extreme accessibility to all operating parts and rugged construction



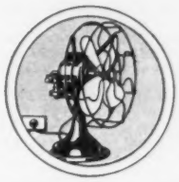
are some of the advantages offered in this starter. Installation of the starter is extremely simple as only four screws are required to hold it in place. Releasing two other screws permits the contactor panel to swing out, thus making the contacts easily accessible. A cover of the drop hinge type encloses the entire mechanism and permits installation of starters closely grouped. The safety push button can be mounted on the side of the starter box or arranged for remote control.

Wrinkle Finish

Chadeloid Chemical Co., 100 William St., New York, announces a wrinkle finish coating composed of resins and processed drying oils in balanced ratio which on baking forms a resistant surface of delicate traceries exhibiting an artistic textured effect. The accompanying illustration



shows this finish applied to flush plates. Wrinkle finish may be used either in a single coat or with added coats of lacquer or enamel, and it may be produced in natural color or with bronze or aluminum powders or pigments that give a wide range of colors. It is applied by spraying and is hardened by baking. The baking temperatures for metal, glass, earthenware and similar objects vary between 180° F. and 400° F., and the time of baking between ½ and 5 hours.



Looking Forward to Many Interesting Things

Much work of importance has come out of Robbins & Myers' experimental room in the last few years, yet we cannot remember when there were so many interesting things under test and development by R & M engineers as right now. Some of these are devices which inventors and other manufacturers have carried along to the verge of production, and want Robbins & Myers' engineers to make sure they are right before giving them to the public. Others represent ideas that their originators could develop only so far, and are brought to us to see if we can solve the problems, remove the "bugs," and perfect them into working form.

If you have a problem in electrical-motored machinery come to Robbins & Myers. We offer you the facilities of a completely modern plant, and the experience of 31 years' precision manufacture in designing, building and applying electric motors, generators, fans, and electrical appliances

Partial List of Apparatus to which Robbins & Myers Motors have been successfully applied

Adding Machines	Confectioner's Machinery	Humidifiers	Movie Projectors
Advertising Displays	Conveyors	Ironing Machines	Portable Tools
Air Compressors	Dental Lathes	Labeling Machines	Printing Presses
Baker's Machinery	Dish Washers	Oil Burners	Spray Equipment
Blowers	Driers	Office Appliances	Ticket Selling Machines
Brick Machinery	Floor Surfacers	Organ Blowers	Vacuum Cleaners
Churns	Folding Machines	Mailing Machines	Ventilating Fans
Cloth Cutters	Heaters	Machine Tools	Unit Heaters
Coffee Mills	Heat Regulators	Meat Choppers	Washing Machines
Coin Counters	Hoists	Milking Machines	Wrapping Machines

Robbins & Myers, Inc.

Springfield, Ohio **Brantford, Ontario**

1878

1929

Index of Raw Materials, Parts, Electrical Equipment

For all electrical products including electrically operated machines and appliances

Trade Names—Manufacturers' Names—Local Addresses

The names of all manufacturers are grouped alphabetically under the heading for the product they manufacture. Trade names also appear in alphabetical position under the subject identifying the product. Thus "Linolac" insulating varnish will be found in alphabetical position under the heading "Paint, Varnish, Lacquer."

Note: The Classified Index of ELECTRICAL MANUFACTURING is limited to those subjects of interest to the specific field which it covers, for obvious reasons. A complete Classified Index of all electrical commodities bought, sold, or used by Electrical Supply Jobbers, Contractors, Dealers, Central Stations and other electrical industry outlets appears regularly in each issue of ELECTRICAL RECORD as heretofore.

ALLOYS, LIGHT METAL
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bohnalite. See Bohn Aluminum & Brass Corp.

ALUMINUM
(Also Aluminum Bronze Powder.)
Albron, Alcoa, Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh.

AMMETERS. See Instruments.

ARMATURE
Balancers. See Balancers, Armature.
Banding Machines. See Banding Machines, Armature
Bearings. See Bearings.
Buggies. See Lifts, Armature.
Coil Presses. See Presses, Armature Coil
Coils. See Coils, Finished.
Core Punchings. See Discs, Armature.
Cranes. See Lifts, Armature.
Discs. See Discs, Armature.
Driers. See Ovens.
Growlers. See Testers, Coil.
Hoists. See Lifts, Armature.
Impregnators, Vacuum. See Ovens, Industrial.
Jacks. See Lifts, Armature.
Laminations. See Discs, Armature.
Lathes. See Lathes.
Lifts. See Lifts, Armature.
Mew. See Coils, Finished.
Notching Machines. See Notching Machines, Armature.
Pegs. See Pegs, Armature.
Pinion Pullers. See Pullers, Armature Shaft.
Repaired. See Repairing and Second-Hand.
Shaft Pullers. See Pullers, Armature Shaft.
Shaft Straighteners. See Straighteners, Armature Shaft.
Stands. See Stands, Armature.
Test Benches. See Test Benches, Armature.
Testers. See Testers, Coil; also Test Benches, Armature.
Torpedo Cord. See Twine, Armature Winding.
Trouble Shooters. See Testers, Coil; also Test Benches, Armature.
Trucks. See Lifts, Armature.
Wedges. See Pegs, Armature.
Winding Machines. See Winding Machines, Armature & Field Coil.
Winding Twine. See Twine, Armature.

ARMATURE & COIL SPRAY GUNS. See Spraying Outfits.

ARMORING MACHINES. See Wire Manufacturing Machines.

ARMS, FLEXIBLE. See Tubing Flexible Metallic.

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Paper & Sheet. See Asbestos.
Slabs. See Asbestos Slabs.
Tape. See Tape, Asbestos.
Wire. See Wire, Insulated.
Yarn and Thread. See Yarn and Thread.

ASBESTOS
Sheet, Paper, Mill Board, Lumber.
Asbestos, Shingle, Slate & Sheathing Co., Ambler, Pa.
Easco. See Eastern Asbestos Co.
Eastern Asbestos Co., Providence, R. I.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
Johns-Manville Corp., New York, N. Y.

ASBESTOS SLABS
Slabs & Barriers for Switchboard.
Asbestos-Ebony. See Johns-Manville, Inc.
Asbestos Shingle Slate & Sheathing Co., Ambler, Pa.
Deceleco, Inc., Wayne, Mich.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
Johns-Manville Corp., New York, N. Y.
Transite. See Johns-Manville, Inc.
Zellite. See Deceleco, Inc.

BAGS, Vacuum Cleaner
Merrimack Mfg. Co., Boston, Mass.

BALANCERS, Armature
(Dynamic Balancing Machines—Balancing Ways).
Anderson Bros. Mfg. Co., Rockford, Ill. (Ways).
Armature Coil Equip. Co., 2415 Forestdale Ave., Cleveland, O. (Machine).
Bowsher Co., N. P., South Bend, Ind.
Olsen Testing Machine Co., Tinius, 500 N. 12th St., Philadelphia, Pa. (Machines).
Sundstrand Machine Tool Co., Rockford, Ill.
Twentieth Century. See Sundstrand Machine Tool Co.
Vibration Specialty Co., 1534 Winter, Philadelphia, Pa. (Machines).

BALL BEARINGS. See Bearings, Ball and Roller.

BANDING MACHINES, Armature
Columbia Machine Wks. & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridion Company, Frank, Boston, Mass.

BARRIERS, Switchboard. See Slate; also Soapstone; also Asbestos.

BARS, BUS. See Brass, Bronze & Copper; also Aluminum.

BARS, Commutator
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.
Buckeye Tempered Copper & Brass Co., Mansfield, O.
Cameron Electric Mfg. Co., Ansonia, Conn.
Commutator Co., 121 N. Front, Minneapolis, Minn.
Electric Materials Co., North East, Pa.
Eureka Metal Products Corp., North East, Pa.
Homer Commutator Co., 4743 Hough Ave., N. E., Cleveland.
Rome Brass & Copper Co., Rome, N. Y.

BASES, Radio Tube. See Radio Molded Parts.

BASES, Reading Lamp
Metal, Pottery, Wood & Glass.
American Ring Co., Waterbury, Conn.
Aladdin Mfg. Co., Muncie, Ind.

Armor Bronze Co., Garwood, N. J.
Camden Art Tile & Pottery Co., Camden, Ark.
Colonial. See Old Colony Iron Wks.
Estes & Sons, E. B., 5844 Grand Central Terminal, New
Fulper Pottery Co., Flemington, N. J.
Globe Metal Spinning Co., 178 Centre, New York, N. Y.
Hemill Products, Inc., 103 Mott, New York, N. Y.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Marbleart. See Insulation Mfg. Co.
Natural. See Insulation Mfg. Co.
Old Colony Iron Wks., Bridgeport, Conn.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sneath Glass Co., Hartford City, Ind.
Van Briggle Tile & Pottery Co., Colorado Springs, Colo.
Weller, S. A., Zanesville, O. (Pottery.)
Yokel Corp., 219 Homestead Ave., Hartford, Conn.
Zane Pottery Co., South Zanesville, O.

BATTERY CHEMICALS. See Chemicals, Battery.
BATTERY CUT OUTS. See Switches, Battery.
BATTERY GAGES. See Instruments, Pocket.
BATTERY JARS. See Jars, Battery, Glass; also Rubber; also Molded Insulation.
BATTERY OXIDES. See Chemicals, Battery.
BATTERY SALTS. See Chemicals, Battery.
BEAD CHAIN. See Chain, Socket.
BEADS. Chandelier. See Crystals, Chandelier.

BEADS, Insulating
American Lava Corp., 1425 William, Chattanooga, Tenn.
Dureo. See Struthers Dunn, Inc.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Struthers Dunn, Inc., 1135 Race, Philadelphia, Pa.
Stupakoff Laboratories, 4627 Hamilton Ave., Pittsburgh, Pa.

BEARINGS
Ball & Roller. See Bearings, Ball & Roller.
Graphite. See Bearings, Oil-less.
Oil-less. See Bearings, Oil-less.
Sleeve. See Bearings & Bushings.

BEARINGS, Ball and Roller
Ahlberg Bearing Co., 312 E. 29th, Chicago, Ill.
Auburn Ball Bearings Co., 73 Clarissa, Rochester, N. Y.
Bantam Ball Bearing Co., South Bend, Ind.
Bearings Co. of America, Lancaster, Pa.
Commercial. See Schatz Mfg. Co.
C J B. See Ahlberg Bearing Co.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearing Co., Poughkeepsie, N. Y.
Gurney. See Marlin-Rockwell Corp.
Hyatt Roller Bearing Co., Newark, N. J.
Hoffman. See Norma-Hoffman Bearings Corp.
McGill Metal Co., Valparaiso, Ind.
Marlin-Rockwell Corp., Jamestown, N. Y.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
New Departure Mfg. Co., Bristol, Conn.
Nice Ball Bearing Co. (Nicetown), Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Roller Bearing Co. of America, Whitehead Rd., Trenton,
Schatz Mfg. Co., Poughkeepsie, N. Y.
Schubert. See McGill Metal Co.
Standard Steel & Bearings, Inc., Plainville, Conn.
Strom Bearings Co., 4587 Palmer, Chicago, Ill.
S. K. F. Industries, 40 E. 34th, New York, N. Y.
Timken Roller Bearing Co., Canton, O.
Torrington Co., Torrington, Conn.

BEARINGS, Oil-Less
Argute Oilless Bearings Co., 149 Berkeley, Philadelphia, Pa.
B. M. C. See Burlington Metal Corp.
Bogert & Hopper, Inc., 325 Varick, New York, N. Y.
Bound Brook Oil-less Bearing Co., Bound Brook, N. J.
Burlington Metal Corp., Burlington, Wis.
Cleveland Graphite Bronze Co., 880 E. 72nd, Cleveland, O.
Electric Railway Equipment Co., 30 Church, New York, N. Y.
Elreco. See Electric Railway Equipment Co.
Graphalloy. See Graphite Metallizing Co.
Graphite Metallizing Co., Yonkers, N. Y.
Lubrite. See Merriam Bros., Yonkers, N. Y.
Merriam Bros., 185 Amory, Boston, Mass.
Metal Saw & Machine Co., Springfield, Mass.
Moraine Products Co., First & Foundry Sts., Dayton, O.
Neveroil Bearing Co., Wakefield, Mass.
Nolu Oilless Bearing Co., 6 E. Johnson, Philadelphia, Pa.
O. & S. Bearing Co., 315 S. Artillery, Detroit, Mich.
Reliance. See Metal Saw & Machine Co.
Seib Lignum-Vitae Woodturning Co., 93 Boyd Ave., Jersey City, N. J.
United States Graphite Bearing Co., Saginaw, Mich.

BEARINGS AND BUSHINGS
(For Armature Shafts.)
Adjustable Bearing Co., 101 Transportation Bldg., Indianapolis, Ind.
Ajax Metal Co., Philadelphia, Pa.
American Bronze Corp., Berwyn, Pa.
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bunting Brass & Bronze Co., Toledo, Ohio.
Damascus Bronze Co., Pittsburgh, Pa.
Dureo. See Moraine Products Co.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit,
Flood City Mfg. Co., Johnstown, Pa.
Johnson Bronze Co., Dept. G, New Castle, Pa.
Lumen Bearing Co., Buffalo, N. Y.
Moraine Products Co., First & Foundry Sts., Dayton, O.
National Bearing Metal Corp. (More-Jones Brass & Metal Div.), 4930 Manchester Ave., St. Louis, Mo.
United States Graphite Co., Saginaw, Mich.

BELTING, Chain Transmission. See Chain, Power Transmission.

BELTS, Rubber
Molded Cord Rubber Belts for Electrical Appliances.
Fay Rubber Products Co., Elyria, O.
Gilmer Co., L. H., Cottman & Keystone Sts. (Tacony), Philadelphia, Pa.

BENDERS, Coil Loop
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.

BENDING. See Punching & Bending.
BINDING POSTS. See Posts, Binding.

BLADES, Fan
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg
New York, N. Y.
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y.
Torrington Mfg. Co., Torrington, Conn.

BLUESTONE. See Chemicals, Battery.
BOARD, Fuller. See Cloth and Paper.
BOARD, Press. See Cloth and Paper.
BOWL HOLDERS. See Fixture Fittings.
BOX & CABINET BUSHINGS. See Bushings, Box & Cabinet.

BOX BOARD
Container Corp. of America, 111 W. Washington, Chicago
Mid-West Box Co., 111 W. Washington, Chicago.

BOXES, Fibre
Container Corp. of America, 111 W. Washington, Chicago
Corrfibre. See Container Corp. of America.
Mid-West Box Co., 111 W. Washington, Chicago.

BOXES, Sheet Steel. See Cabinets, Sheet Steel.
BOXES, Wood. See Cabinets & Boxes, Wood.

BOXES AND WRAPPERS
Agar Mfg. Corp., Whippany, N. J.
Brown & Bailey Co., 417 N. Eighth, Philadelphia, Pa.
Bulldog. See Pittsburgh Corrugated Paper Box Co.
Campbell Paper Box Co., South Bend, Ind.
Consolidated Paper Co., Monroe, Mich.
Container Corp. of America, 111 W. Washington, Chicago
Gair Co., Robert, 420 Lexington Ave., New York. (Boxes.
Gator-Hide Kraft. See International Paper Co.
Hinde & Dauch Paper Co., 325 Decatur, Sandusky, Ohio
Huntington Paper Box Co., Huntington, Ind.
International Paper Co., 100 E. 42nd, New York, N. Y.
Lake Lithographing Co., 2570 Superior Ave., Cleveland, O. (Display Cartons.)
Mid-West Box Co., 111 W. Washington, Dept. 36, Chicago
National Folding Box Co., New Haven, Conn. (Cartons.)
Pequot Mfg. Corp., Glendale (L. I.), New York.
Pittsburgh Corrugated Paper Box Co., Pittsburgh, Pa.
River Raisin Paper Co., Monroe, Mich.
Rockford Fibre Container Co., Rockford, Ill.
Sefton Mfg. Co., 59 E. Madison, Chicago, Ill.
Shuttleworth Carton Co., 474 W. Broadway, New York.

BRACKETS, Instrument
For Suspending Meters to Station Switchboard.
General Electric Co., Schenectady, N. Y.
Roller-Smith Co., 289 Broadway, New York, N. Y.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

BRAIDING MACHINES. See Wire Manufacturing Machines.

BRASS TUBING. See Tubing, Brass and Copper.

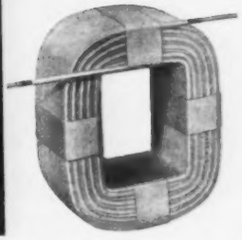
BRASS, BRONZE AND COPPER
Sheet, Rod, Bar.
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.
American Nickeloid Co., Peru, Ind.
Baltimore Brass Co., 1212 Wicomico, Baltimore, Md.
Baltimore Copper Mills, (Div. of General Cable Corp.) Baltimore, Md.
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bohnalite. See Bohn Aluminum & Brass Corp.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Buffalo Bronze Die Cast Corp., 100 Arthur, Buffalo, N. Y.
Dallas Brass & Copper Co., 820 Orleans, Chicago, Ill.
Durbar. See Buffalo Bronze Die Cast Corp.
Electric Materials Co., North East, Pa.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit,
Nickeloid. See American Nickeloid Co.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.
Titan Metal Mfg. Co., Bellefonte, Pa. (Rods and Forgings.)

BREAKERS, Circuit. See Circuit Breakers.
BRIDGES, Wheatstone. See Instruments, Laboratory Standard.
BRONZE. See Brass, Bronze and Copper; also Castings
BRONZE, Phosphor. See Phosphor Bronze.
BRONZE POWDER, Aluminum. See Aluminum.
BRUSH HOLDERS. See Brushes, Commutator.
BRUSHES, Carbon. See Brushes, Commutator.
Graphite. See Brushes, Commutator.
Metal Graphite. See Brushes, Commutator.

BRUSHES, COMMUTATOR
(Brushes, Brush Holders and Flexible Leads.)

Brush Holders	See H
Carbon, Graphite, Metal Graphite	See C
Flexible Leads and Pig Tails	See L
Sheet Metal	See S
Wire Gauze	See W

Automotive Mfg. Co., Kansas City, Mo. . . . . H
B. B. B. See Becker Bros. Elec'l Corp.
Baylis Co., Bloomfield, N. J. . . . . H
Becker Bros. Elec. Corp., 23 N. Jefferson, Chicago, Ill. . . . . C W S H L
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y. . . . . C . . . . .
Boxill-Bruel Carbon Co., Columbia Park, O. C . . . . H . .
Calebaugh Self-Lubricating Carbon Co., 1503 Columbia Ave., Philadelphia, Pa. . . . . C . . . . .



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BRUSHES, Commutator—Continued
Carbon Engrg. Co., Slinger, Wis..... C
Carbon Laboratories Co., 5005 Euclid Ave., Cleveland, O..... C
Carbon & Graphite Corp., 227 West Broadway, New York, N. Y..... C
Carenco. See Carbon Engineering Co.
Chapin Co., Chas. E., 227 Fulton St., New York, N. Y..... C W S L
Columbia Machine Wks., & M. I. Co., 263 Chestnut, Brooklyn, N. Y..... H
Cooley Mfg. Co., 98 Park Place, New York.. W
Diamond C. See Chapin Co., Chas. E.
Dixon Crucible Co., Joseph, Jersey City.....
Electra. See Automotive Mfg. Co.
Electric Accessories Co., 310 York Ave., Philadelphia, Pa..... H
Electro-Nite Carbon Co., 308 N. Fourth, Philadelphia, Pa.....
Eureka Metal Products Corp., North East, Pa..... W S H
Fleck Carbon Co., 508 Broome, New York C
General Electric Co., Schenectady, N. Y.... C H
Graphalloy. See Graphite Metalizing Corp.
Graphite Metalizing Corp., 1040 Neppenhan Ave., Yonkers, N. Y..... C H
Henrite Products Co., 98 Park Place, New York, N. Y..... C
Holland Trolley Supply Co., 1623 E. 43rd, Cleveland, Ohio..... H
Jeandron, W. J., 345 Madison Ave., New York, N. Y. (Imported)..... C
Keystone Carbon Co., 4630 N. 11th, Philadelphia, Pa..... C
Kohlenite Products Co., 417 W. 23th, New York, N. Y..... C
Le Carbone. See Jeandron, W. J.
Le Valley Vitae Carbon Brush Co., 4851 Grand Central Terminal, New York, N. Y. C
Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich..... C
Morganite Brush Co., 33-02 48th Ave., Long Island City, N. Y..... C
National Carbon Co., Cleveland, O..... C
New Process Carbon Co., 1503 Columbia Ave., Philadelphia, Pa..... C L
No Spark. See Calebaugh Self-Lubricating.
Ohio Carbon Co., 8215 Almira Ave., Cleveland, Ohio..... C W L
Ohio Elec. Specialty Mfg. Co., Troy, O..... W
Perfection Supply Co., 98 Park Pl., New York, N. Y..... C W S H L
Pittsburgh Carbon Brush Co., 127 Fancourt, Pittaburgh, Pa..... C
Pure Carbon Co., Wellsville, N. Y..... C W S L
Pyramid. See National Carbon Co.
Reaction. See Baylis Co.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y..... W L
Salem Electrical Supply Co., Salem, Mass.. W
Seabury, Ralph L., Factories Bldg., Toledo, O. C
Snarr & Co., Geo. W., 110 S. Ninth, St. Louis, Mo..... C
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y..... C L
Speer Carbon Co., St. Mary's, Pa..... C
Stackpole Carbon Co., St. Mary's, Pa.... C
Sterling. See Carbon Laboratories Co.
Superior Carbon Products Co., North Rd., Poughkeepsie, N. Y..... C
U. S. Graphite Co., Saginaw, Mich..... C
Universal. See Graphite Metalizing Corp.
Weber Elec. Wks., Brooklyn Sts., Cleveland. C L

BRUSHES, PNEUMATIC SPRAYING. See Spraying Outfits.

BRUSHES FOR VACUUM CLEANERS

Omaha Brush Co., 339 N. 15th, Omaha, Neb. (Brushes rebristled.)
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.

BUGGIES, Armature. See Lifts, Armature.

BULBS, Glass

For Incandescent Lamps and Tubes.
Almo Mfg. Co., 38 Crawford, Newark, N. J.
Corning Glass Wks., Corning, N. Y.
Fayette Glass Bulb Co., 229 21st, Brooklyn, N. Y.
Libby Glass Co., Toledo, O.

BUNCHING MACHINES. See Wire Manufacturing Machines.

BUSHINGS, SHAFT. See Bearings and Bushings.

BUSHINGS, Box and Cabinet, Porcelain

Appleton Electric Co., 1704 Wellington Ave., Chicago, Ill
Columbia Metal Box Co., 226 E. 144th St., New York, N. Y.
Harter. See Multi Elecl. Mfg. Co.
Knox Porcelain Corp., Knoxville, Tenn.
Mineralac Electric Co., 25 N. Peoria, Chicago, Ill.
Multi Electric Mfg. Co., 210 N. Ogden Ave., Chicago, Ill.
Nelson Elec. Co., Plant City, Fla.

CABINET GRILL CLOTH. See Cloth, Untreated.

CABINETS, Fibre

Continental-Diamond Fibre Co., Bridgeport, Pa.
Vulcawood. See Continental-Diamond Fibre Co.

CABINETS, Refrigerator. See Refrigerator Cabinets

CABINETS, Sheet Steel

Stamped and Turned-up Boxes and Cabinets.
Acme Blow Pipe & Sheet Metal Wks., New Orleans, La.
Adam Electric Co., Frank, St. Louis, Mo.
All-Steel-Equip. Co., Aurora, Ill.
American Metal Wks., 4868 Stanton Ave., Philadelphia, Pa.
American Steel Furniture Co., 27 W. 24th, New York, N. Y.
Aurora Steel Products Co., Aurora, Ill.

Benjamin Elec. Co., 1378 E. 16th, Los Angeles, Cal.
Berks Engineering Co., Reading, Pa.
Berthold Elec. Co., Gus, 551 W. Monroe, Chicago, Ill.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Chicago Hdwe. Foundry Co., North Chicago, Ill.
C. & P. Electric Wks., Springfield, Mass.
Cleveland Switchboard Co., 2925 E. 79th, Cleveland, O.
Coast Specialty Co., 73 E. Sixth, Portland, Ore.
Cole Metal Products Co., 33 Crescent, Long Island City.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Columbia Elec. Mfg. Co., 59 Columbus Sq., San Francisco, Cal.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Columbian Steel Tank Co., 1505 W. 12th, Kansas City, Mo
Commercial Mfg. & Supply Co., 1443 Delaware St., Denver.
Diamond Elec'l Mfg. Co., 1330 E. 16th, Los Angeles, Cal.
Dowman-Dozier Mfg. Co., 1314 Murphy Ave., S. W., Atlanta, Ga.
Electric Apparatus Co., 704 N. Halsted, Chicago, Ill.
Electric Panelboard Co., 426 Exchange, Rochester, N. Y.
Federal Steel Products Co., 2 Ave. L, Newark, N. J. (Polarized Boxes.)
Fouch Elec. Mfg. Co., 105 N. Ninth, Portland, Ore.
Greater New York Metal Box Co., Inc., 143 W. 19th, New York.
Green Elec. Co., 31 N. Water, Rochester, N. Y.
Gurney Sheet Metal Wks., 718 E. 4th, Long Beach, Cal.
Hauer, J. B., Driggs Ave. and N. 11th, Brooklyn, N. Y.
Holzer Sheet Metal Wks., Inc., New Orleans, La.
Hough Mfg. Co., 2520 24th, Detroit, Mich.
Isert Co., J. H., 1234 Rowan, Louisville, Ky.
Karp Metal Products Co., 129 30th, Brooklyn, N. Y.
Kirtland Elec. Construction Co., 34 Herkimer, Albany, N. Y.
Larzelere Mfg. Co., 606 Cherry St., Philadelphia.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland, O.
Lexington Elec. Products Co., 419 E. 24th, New York, N. Y.
Lorentzen, H. K., 155 Leonard, New York, N. Y.
MacMillen Mfg. Co., 1400 N. Spring, Los Angeles, Cal.
Mansfield Elec. Hardware Co., Longview Ave., Mansfield, O.
Metropolitan Elec. Co., 2914 First Ave., S., Seattle, Wash.
Metropolitan Elec. Products Co., Blvd. at 14th, Long Island City, N. Y.
Milwaukee Vault & Cabinet Co., 521 Market, Milwaukee.
Mosher, S. L., 1951 Lawrence, Denver, Colo.
National Metal Box Co., Van Dyke & Ferris Sts., Brooklyn.
Newman Elec. & Mfg. Co., Eau Claire, Wis.
Par-Metal Products Corp., 3519 41st, Long Island City, N. Y.
Penn Electrical Co., 35 Water, Irwin, Pa.
Powerlite Switchboard Co., 4149 E. 79th, Cleveland, O.
Rezloh. See Holzer Sheet Metal Works.
Robbins & Myers, Inc., Springfield, O.
Security. See Aurora Steel Products Co.
Standard Metal Box Corp., 950 Grand St., Brooklyn, N. Y.
Star Metal Box Co., 238 46th, Brooklyn, N. Y.
Superior Switchboard & Devices Co., 420 Schroyer Ave., Canton, O.
Tanner & Co., Wm. F., 511 S. Sharp, Baltimore, Md.
United Metal Box Co., 473 President, Brooklyn, N. Y.
United Sheet Metal Wks., 575 Howard, San Francisco.
Universal Metal Box & Products Co., 316 Colt, Irvington N. J.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Wiegman & Co., E. M., 1908 Benton, St. Louis, Mo.
Wurdack Elec. Mfg. Co., 4444 Clayton Ave., St. Louis, Mo.

CABINETS AND BOXES, Wood

Accurate Molding Corp., 20 Morton, Brooklyn, N. Y.
Adler Mfg. Co., Louisville, Ky.
Adler Royal. See Adler Mfg. Co.
Ampere. See Donehue Lumber Co.
Aston Cabinet Mfrs., 1223 W. Lake, Chicago, Ill.
Boehm Cabinet Co., J., 2216 W. 63rd St., Cleveland, O.
Carolina Wood Products Co., Asheville, N. C.
Carrom Co., Ludington, Mich.
Caswell-Runyon Co., Huntington, Ind.
Cheney Piano Action Co., A. C., Castleton, N. Y.
Chickasaw Furniture Mfg. Co., Memphis, Tenn.
Clinton Corp., 342 Madison Ave., New York, N. Y.
Conrades Mfg. Co., 1942 N. Second, St. Louis, Mo.
Corlieth Cabinet Mfg. Co., St. Mary's, Pa.
Cory Cabinet Corp., Springfield, Mo.
Deiker Co., Geo., Henderson, Ky.
Ebert Furniture Co., 225 W. 34th, New York, N. Y.
Efferi & Sons, Frederick, 44 Central Ave., Brooklyn, N. Y.
Empire-United Hat Block Co., 312 E. 22nd, New York.
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Excel Phonograph Mfg. Co., 400 W. Erie, Chicago, Ill.
Excello Products Corp., 4836 W. 16th, Cicero, Ill.
Federal Wood Products Corp., 206 Lexington Ave., New York, N. Y.
Findlay Mfg. Co., Metropolitan & Morgan Aves., Brooklyn.
Grand Rapids Furniture Co., Grand Rapids, Mich.
Gulbransen Co., 3232 Kedzie, Chicago, Ill.
Harper Mfg. Co., Cassopolis, Mich.
Hickory Box Co., Hickory, N. C.
Hubbell, H. L., 59 Market Ave., N. W., Grand Rapids.
Interstate Woodworking Co., 46 Wooster, New York, N. Y.
Karpen. See Studner Bros.
King Mfg. Corp., Bano & Crowley, Buffalo, N. Y.
Klumpp Sons, John G., 13 Baxter, New York, N. Y.
Knoxville Table & Chair Co., Knoxville, Tenn.
National Cabinet Co., New Philadelphia, O.
New England Box Co., Greenfield, Mass.
Ohio Valley Cabinet Co., Wheeling (Warwood), W. Va.
Oneida Cabinet Corp., Oneida, N. Y.
Ottawa Furniture Co., Holland, Mich.
Pooley Co., 16th & Indiana Ave., Philadelphia, Pa.
Radio Allied Mfrs. Corp., 1340 S. Michigan Ave., Chicago.
Radio Cabinet Mfg. Corp., Furniture Mart, Chicago, Ill.
Radio Cabinet & Equipment Co., 1504 Vine, Philadelphia
Radio Mfg. Co., Div. of Pilliod Lumber Co., Swanton, O
Radio Master Corp., Bay City, Mich.
Red Lion Cabinet Co., Red Lion, Pa.
R. E. Z. Cabinet Co., 54 North, Boston, Mass.
Rockford Sales Corp., 206 Lexington Ave., New York, N. Y

Schutz Bros., 152 Chambers, New York, N. Y.
Showers Bros. Co., Bloomington, Ind.
Signal Elec. Mfg. Co., Menominee, Mich.
Southern Toy Co., Hickory, N. C.
Specialty Display Case Co., Kendallville, Ind.
Starr Piano Co., Richmond, Ind.
Stradivara Co., Coshocton, Ohio.
Stettner Phonograph Corp., 318 E. 75th, New York.
Studner Bros., 67 W. 44th, New York, N. Y.
Superior Cabinet Corp., 206 Broadway, New York, N. Y.
Syracuse Screen & Grille Co., North Manchester, Ind.
Tessier Bros., 355 Bridge, Northampton, Mass. (Radio.)
Trenton Wood Specialty Co., Stokes Ave. and P. R. R., Trenton, N. J.
Udell Wks., 28th and Barnes Ave., Indianapolis, Ind
United Reproducers Corp., 25 Leighton Ave., Rochester, N. Y.
West Box Co., 235 Liberty, Springfield, Mass
Wood Cabinet Corp., 196 Lexington Ave., New York, N. Y.

CABLE ARMORING MACHINES. See Wire Manufacturing Machines.

CABLE TEST SETS. See Instruments, Portable and Switchboard.

CABLING MACHINES. See Wire Manufacturing Machines.

CANDLES, Fixture

Glass, Fibre Paper.
Brandywine Fibre Products Co., 1402 Walnut, Wilmington.
Cleveland Container Co., 10800 Berea Rd., Cleveland, O.
Fibro Products Co., New Bedford, Mass.
Franklin Fibre Specialty Co., 173 Lafayette, New York, N.Y
Phoenix Glass Co., Monaca, Pa.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Seamless. See Fibro Products Co.

CANOPY (Canopies). See Fixture Fittings.
Insulators. See Insulators.
Switches. See Switches, Snap.

CAPACITORS, RADIO. See Radio Circuit Components.

CARBON, Powdered

Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.

CARBONS, Battery. See Carbons.
Arc Light. See Carbons.

CARBONS

Battery Arc Light.
Becker Bros. Elecl. Corp., 23 N. Jefferson, Chicago, Ill.
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y.
Columbia. See National Carbon Co.
Daylight. See National Carbon Co.
Lessing Battery. See Blanck & Carrier Corp.
Nuernberg Battery. See Blanck & Carrier Corp.
National Carbon Co., Cleveland, Ohio.
Oretip. See National Carbon Co.
Silvertip. See National Carbon Co.
Speer Carbon Co., St. Mary's, Pa.
Stackpole Carbon Co., St. Mary's, Pa.

CARTONS. See Boxes and Wrappers.

CASEIN PLASTICS. See Molded Insulation.

CASES, Eliminator. See Cases, Eliminator.
Flashlight. See Cases, Flashlight.

CASES, Eliminator

Brumberger Co., 252 Pearl, New York, N. Y.
Grand Sheet Metal Wks., 176 Grand, New York, N. Y.
Karp Metal Products Co., 129 30th, Brooklyn.
Luna Tin Mfg. Co., 547 W. 21st, New York, N. Y.

CASES, Flashlight

Bridgeport Brass Co., 744 E. Main, Bridgeport, Conn.
Lincoln Fibre Specialty Co., Newport, Del.
St. Louis Paper Can & Tube Co., St. Louis, Mo.
Underwood Battery Co., 1250 Ontario, Cleveland, O.

CASTINGS, Aluminum. See Castings, Aluminum. Also
Castings, Copper, etc.
Brass. See Castings.
Bronze. See Castings.
Copper. See Castings.
Die. See Castings, Die.
Monel Metal. See Castings.
Steel. See Castings, Steel.
White Metal. See Castings.

CASTINGS, Aluminum

Aluminum Co. of America, 2471 Oliver Bldg., Pittsburgh.
Berks Foundry & Mfg. Co., West Hamberg, Pa.
Bohm Aluminum & Brass Corp., Detroit, Mich.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Dick Bros., Inc., Reading, Pa.
Eureka Metal Products Corp., North East, Pa.
Monarch Aluminum Ware Co., 9301 Detroit Ave., Cleveland,
National Bronze & Aluminum Foundry Co., 88th & Lazy, Cleveland O.
Quality Aluminum Casting Co., Waukesha, Wis.
Tenual. See National Bronze & Aluminum Foundry Co.
Veco Mfg. Co., South Norwalk, Conn.

CASTINGS

Copper, Brass, Bronze, Monel Metal, White Metal.
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Berks Foundry & Mfg. Co., West Hamberg, Pa.
Bohn Aluminum & Brass Corp., Detroit.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Bridgeport Castings Co., 250 North Ave., Bridgeport, Conn.
Central Pattern & Foundry Co., 3737 S. Sacramento Ave., Chicago, Ill.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Hardware Foundry Co., North Chicago, Ill.
Delta Star Electric Co., 2437 Fulton, Chicago, Ill.
Dick Bros., Inc., Reading, Pa.
Eureka Metal Products Corp., North East, Pa.
Faries Mfg. Co Decatur, Ill.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit,
Harsch, John, Bronze & Foundry Co., 11612 Madison Ave., Cleveland, O.
McGill Metal Co., Valparaiso, Ind.
National Bronze & Aluminum Foundry Co., 88th & Lazy, Cleveland, O.
Ohio Pattern Wks. & Fdy. Co., 2730 Spring Grove Ave., Cincinnati, O.

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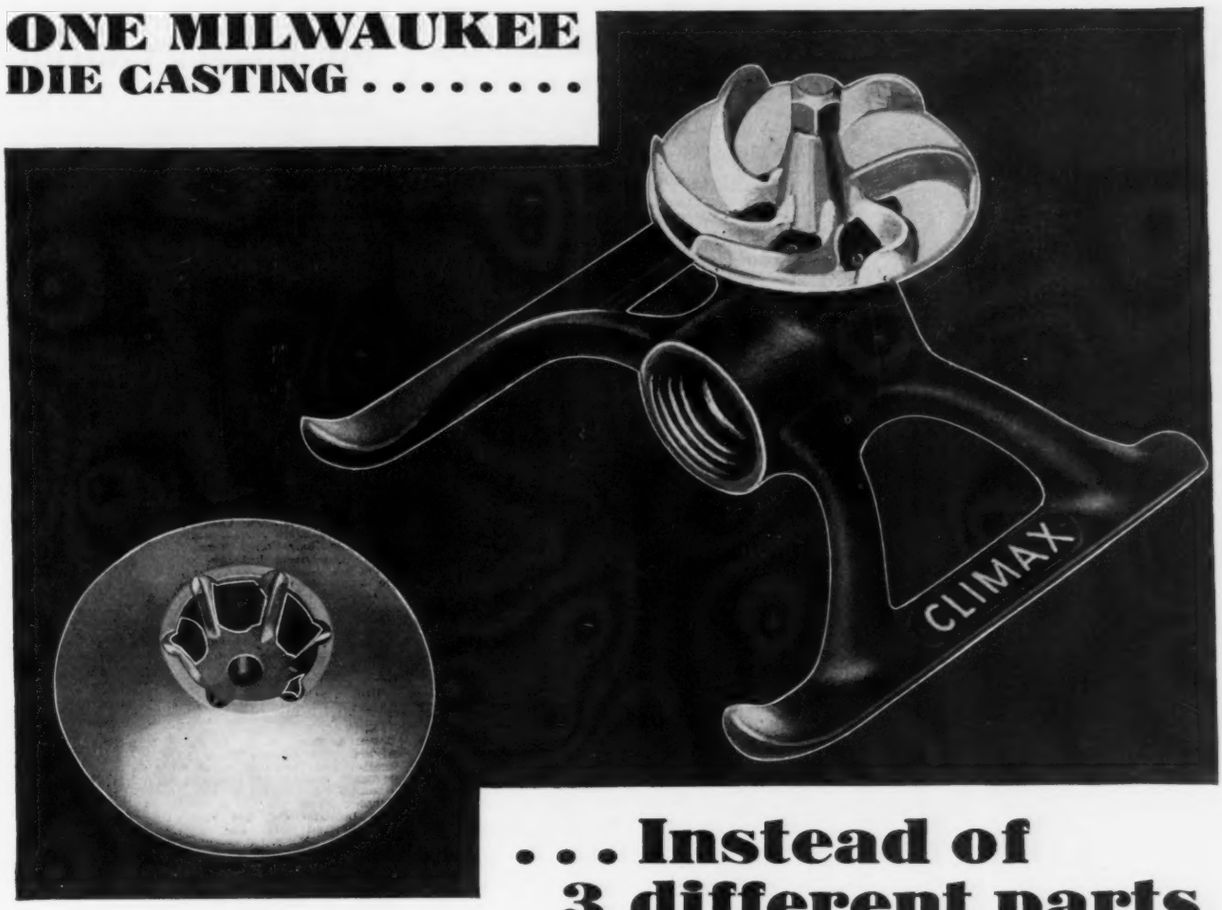

The top illustration shows the Climax Sprinkler, and presents a clear view of the top surface of the die-cast rotary.

The lower illustration presents the bottom view of the die-cast rotary alone.

. . . Instead of 3 different parts

Smoother—No Machining

THE Climax Lawn Sprinkler, made by the Hamilton Metal Products Co. of Hamilton, O., provides the theme for another story of improved design, better performance, fewer parts, simplified production and lower costs through the use of a Milwaukee Die Casting.

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The die cast rotary is delivered complete, ready for assembly. Its smooth, cone-shaped lower surface requires no buffing or polishing. Its light weight makes it much easier running than the type formerly used.

Die casting this part, and one other improvement, has enabled the manufacturers to increase production, reduce overhead and offer a lawn sprinkler that is extremely simple in design and operation.

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Rabun Bronze Foundry, 617 West Belgrave, Huntington Park, Cal.
Sterling Art Metal Wks., 40 Purvis, Long Island City, N. Y.
Tenual. See National Bronze & Aluminum Foundry Co.

CASTINGS, Die

Advance Tool & Die Casting Co., 1654 Holton, Milwaukee, Wis.
Alemite Die-Casting & Mfg. Co., 2640 Belmont Ave., Chicago, Ill.
Allied Die-Casting Corp., Long Island City, N. Y.
Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2471 Oliver Bldg., Pittsburgh.
Aluminum Industries, Inc., 2438 Beekman, Cincinnati, O.
American Die Casting Co., 2040 Dominick, Chicago, Ill.
Badger Die Casting Co., 156 East Buffalo, Milwaukee, Wis.
Barnhardt Bros. & Spindler, Monroe & Throop St., Chicago.
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bohnalite. See Bohn Aluminum & Brass Corp.
Do-Di. See Doehler Die Casting Co.
Doehler Die Casting Co., 386 Fourth Ave., New York, N. Y.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit.
Franklin Die Casting Corp., 826 Gifford, Syracuse, N. Y.
Illinois Die Castings Co., 551 W. Congress, Chicago, Ill.
Krone-Seebek Die Casting & Mfg. Co., 2935 W. 47th, Chicago, Ill.
Milwaukee Die Casting Co., 289 Fourth, Milwaukee, Wis.
Newton Die Casting Corp., 146 Munson, New Haven, Conn.
Paragon Die Casting Co., 2701 N. Crawford Ave., Chicago.
Perfection Die Casting Corp., 406 Lakeside Ave., N. W., Cleveland, O.
Permite. See Aluminum Industries, Inc.
Stewart Die Casting Co., 4500 Fullerton Ave., Chicago, Ill.
Superior Die Casting Co., 875 E. 70th, Cleveland, Ohio.
Twin City Die Castings Co., Talmadge and 33rd Aves., S. E., Minneapolis, Minn. (White Metal).

CASTINGS, Gray Iron

American Engineering Co., Philadelphia, Pa.
Athens Foundry Co., Athens, Pa.
Barlow Foundry Co., 551 N. J. R. R. Ave., Newark, N. J.
Barnett Foundry Co., Newark, N. J.
Berks Foundry & Mfg. Co., West Hamberg, Pa.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Bridgeport Castings Co., 250 North Ave., Bridgeport, Conn.
Chicago Hardware Foundry Co., North Chicago, Ill.
Dick Bros., Inc., Reading, Pa.
Eastern Malleable Iron Co., Naugatuck, Conn.
Fairmount Foundry, Inc., Third & Westmoreland Sts., Philadelphia, Pa.
Forest City-Walworth Run Fuondries Co., 2500 W. 27th, Cleveland, O.
Gray Iron Foundry Co., Reading, Pa.
Milwaukee Grey Iron Foundry Co., 3910 Mitchell, Milwaukee, Wis.
North Lebanon Foundry Co., Second & Canal, Lebanon, Pa.
North Wales Mach. Foundry Co., North Wales, Pa.
Products Machine Co., Bridgeport, Conn.
Sacks Iron Foundry, L., 357 Wilson Ave., Newark, N. J.
Snead & Co., Pine St., Jersey City, N. J.
St. Louis Malleable Castings Co., 7701 N. Conduit Ave., St. Louis, Mo.
Union Mfg. Co., New Britain, Conn.
Western Foundry Co., Kedzie Ave. at 36th, Chicago, Ill.

CASTINGS, Steel

Bonney-Floyd Co., Columbus, Ohio.
Eastern Steel Casting Co., Ave. L & Edward St., Newark.
Northwestern Steel & Iron Corp., 2907 Fourth, S. E., Minneapolis, Minn.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Procian. See Northwestern Steel & Iron Corp.
Riverside Steel Casting Co., Jacobus Ave., Kearney, N. J.

CEMENT, Commutator

Anchorlute. See Technical Products Co.
Commutator Companion. See Withington Div. of Marnot Co.
Conductalute. See Technical Products Co.
Early, Edward E., 1129 W. Fifth, N. W., Canton, O.
Fixkwick. See Technical Products Co.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Electric Co.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Mitchell Rand Mfg. Co., 19 Vesey, New York, N. Y.
Perce-Lute. See Perfection Supply Co.
Perfection Supply Co., 98 Park Pl., New York, N. Y.
Plas Mica Co., 26 St. Andrews Place, Yonkers, N. Y.
Technical Products Co., 116 S. Sheridan Sq., Pittsburgh, Pa.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Withington Div. of Marnot Co., 50 Thayer, Boston, Mass.

CEMENT, Liquid Porcelain

Anchorlute. See Technical Products Co.
Fire Lute. See Technical Products Co.
Insa-Lute. See Technical Products Co.
Okonite Co., Passaic, N. J.
Patch-O-Namel. See Technical Products Co.
Repairet Mfg. Co., Milwaukee, Wis.
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.
Technical Products Co., 114 S. Sheridan Sq., Pittsburgh, Pa.
Thermold. See Technical Products Co.
CHAIN, Chandelier (Fancy). See Crystals, Chandelier
CHAIN DRIVES. See Chain, Power Transmission

CHAIN, Fixture

Acco. See American Chain Co.
American Chain Co., Bridgeport, Conn.
Chase Brass & Copper Co.
Eastern Chair Works, 309 E. 22nd St., New York, N. Y.
Faries Mfg. Co., Decatur, Ill.
Globe Metal Mfg. Co., 2122 E. Hazard, Philadelphia, Pa.
H. & O. Chain Co., So. Norwalk, Conn.
Newark Metal Mfg. Co., 23 S. 6th, Newark, N. J.
Plume & Atwood Mfg. Co., Waterbury, Conn.
Rodale Mfg. Co., 260 Hudson, New York, N. Y.
Steele & Johnson Mfg. Co., Waterbury, Conn.

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Baldwin Chain & Mfg. Co., Worcester, Mass.
Boston Gear Wks. Sales Co., Norfolk Downs, Mass.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Link-Belt Company, 910 S. Michigan Ave., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.
Ramsey Chain Co., Inc., Albany, N. Y.
Reeves Pulley Co., Columbus, Ind.
Renold Boston. See Boston Gear Wks.
Union Chain & Mfg. Co., Sandusky, O.
Whitney Mfg. Co., Hartford, Conn.

CHAIN, Socket

American Ball Chain Works, 12 Wooster St., New York.
Bead Chain Mfg. Co., Bridgeport, Conn.
H. & O. Chain Co., South Norwalk, Conn.
CHANDELIER BEADS. See Crystals, Chandelier.
CHANDELIER CRYSTALS. See Crystals, Chandelier.
CHANDELIER FRINGE. See Crystals, Chandelier.

CHARGERS, Magnet

Charging, Remagnetizing.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Cowie Elec. Co., E. S., 1823 Wyandotte, Kansas City, Mo.
Fore Elec. Mfg. Co., 5255 Wabada Ave., St. Louis, Mo.
Serwell Sales Corp., 1749 N. Winchester Ave., Chicago.
Valley Electric Co., 4221 Forest Park Blvd., St. Louis, Mo.

CHEMICALS, Battery

Electrolyte, Battery Salts, Battery Oxides, Sal Ammoniac, Bluestone, Manganese.
Cooper & Co., Charles, 194 Worth, New York, N. Y.
Eagle-Picher Lead Co., 134 N. LaSalle, Chicago. (Oxide.)
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Electro Chemical Co., 113 W. Court St., Dayton, O.
General Metallic Oxides Co., Jersey City, N. J.
Globe Chemical Co., Murray Rd. and Big Four R. R., Cincinnati, O.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Kalbfleisch Corp., 200 5th Ave., New York, N. Y.
Klipstein Co., 644 Greenwich, New York, N. Y.
Merrimac Chemical Co., 148 State, Boston, Mass.
Powers-Weightman-Rosengarten Co., Philadelphia, Pa.
Voltat. See Powers-Weightman-Rosengarten Co.
Wah Chang Trading Corp., 233 Broadway, New York, N. Y.

CHEMICALS, Refrigeration

Ansul Chemical Co., Marinette, Wis.
Arctic. See Roesler & Hasslacher Chemical Co.
Carbide & Carbon Chemicals Corp., 30 E. 42nd, New York, N. Y. (Butane & Isobutane.)
Dry Ice Corp. of America, 50 E. 42nd, New York, N. Y.
Roessler & Hasslacher Chemical Co., 709 Sixth Ave., New York, N. Y. (Methyl Chloride, Ethyl Chloride.)
Virginia Smelting Co., West Norfolk, Va. (Sulphur Dioxide.)
Chromium Plating. See Plating & Finishing.

CHUCKS, Magnetic

J & H Elec. Co., 161 Clifford, Providence, R. I.
Simmons. See Taft-Pierce Mfg. Co.
Taft-Pierce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S. (Rockdale), Worcester, Mass.

CIRCUIT BREAKERS

Air and Oil Circuit Breakers and Oil Break Switches.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Anderson Mfg Co., Albert & J. M., 289 A, Boston, Mass.
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Automatic Switch Co., 517 E. Larned, Detroit, Mich.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Condit Elec'l Mfg. Corp., 838 Summer St. (South Boston), Boston, Mass.
Cramblett Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn.
Hart & Hegeman Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
High Tension Elecl. Specialty Co., 500 Washington, Abington, Mass.
Hitesco. See High Tension Elecl. Specialty Co.
H. & H. See Hart & Hegeman Div.
Inducto-therm. See Allen-Bradley Co.
I. T. E. Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia, Pa.
Line Material Co., South Milwaukee, Wis. (Oil Switches.)
Maple Co., R. H., Indianapolis, Ind.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Minibraker. See Burke Controller Co.
Roller-Smith Co., 289 Broadway, New York, N. Y.
Sentinel. See Westinghouse Elec. & Mfg. Co.
Takamine Corp., 208 Rawson, Long Island City, N. Y.
Trumbull-Vanderpool Elec. Mfg. Co., Bantam.
U-Re-Lite. See I. T. E. Circuit Breaker Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
CIRCUIT TESTERS. See Testers, Fuse and Circuit.
CLEANER BAGS, Vacuum. See Bags, Vacuum Cleaner.
CLEANER BRUSHES, Vacuum. See Brushes for Vacuum Cleaners.

CLEANERS, Metal

Bakite Products, Inc., 26 Thames, New York, N. Y.

CLIPS, Fuse. See Fuse Clips.

CLIPS, Heater Plug

Gray Bros. Co., Piano, Ill.

CLOCK SWITCHES. See Switches, Time.

CLOTH GEARS. See Gears and Pinions, Composition.

CLOTH LOUD SPEAKER DIAPHRAGM. See Cloth, Untreated.

CLOTH RADIO GRILL. See Cloth, Untreated.

CLOTH, Untreated

Boyle & Co., John, 112 Duane, New York, N. Y.
Canvas, "Aeroplane Cloth." Cotton Duck, Drill, Diaphragm Cloth, Grill Fabrics, etc.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pindall Fabrics Corp., 200 Madison Ave., New York, N. Y. (Grill Cloth)

CLOTH AND PAPER, Insulating

Cloth, Insulated .....See C
Paper, Insulated .....See P

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Press Board (Fuller Board)....See B
Silk .....See S

Acme Wire Co., New Haven, Conn.	C	S	P		
Armco. See Rogers Paper Mfg. Co.					
Armatite. See Mica Insulator Co.					
Brand & Co., William, 268 4th Ave., New York			P		
Campbellite. See National Vulcanized Fibre Co.					
Carboloid Products Corp., 15 Park Row, New York, N. Y.	C		P		
Case Brothers, Inc., Highland, Park, Conn.			P		B
Case Mfg. Co., Unionville, Conn.			P		
Case & Risley Press Paper Co., Oneco, Conn.					
Celoron Co., Bridgeport, Pa.			P	F	B
C-F. See National Vulcanized Fibre Co.					
Chicago Mica Co., 345 Campbell, Valparaiso, Ind.	C				
Columbian Rope Co., Auburn, N. Y.			P		
Continental-Diamond Fibre Co., Bridgeport, Pa.			P		
De Jonge & Co., Louis, 69 Duane, New York, N. Y. (Condenser)			P		
Dexstar. See Dexter & Sons.					
Dexter & Sons, C. H., Windsor Locks, Conn (Condenser Tissue.)					
Dielectric Mfg. Co., St. Louis, Mo.	C	S	P		B
Electrite. See West Virginia Pulp & Paper Co.					
Fyberoid. See Wilmington Fibre Specialty Co.					
General Electric Co., Merchandise Dept., Bridgeport, Conn.	C		P		
Condenser Dept., Bridgeport, Conn.	C		P		
Hartford City Paper Co., Hartford City, Ind. (Glassine Condenser Tissue).					
Hewitt & Bros., C. B., 16 Ferry, New York	C		P		
Hi-Tex. See Stevens Paper Mills.					
Incella. See Tarentum Paper Mills Co.					
Irvington Varnish & Insulator Co., Irvington, N. J.	C	S	P		
Manning Paper Co., J. A., Troy, N. Y.					B
Mica Insulator Co., 200 Varick, New York	C	S	P		B
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.			P		
National Vulcanized Fibre Co., Wilmington, Del.				F	
New Jersey Wood Finishing Co., Woodbridge, N. J.	C				
Ohmoid. See Wilmington Fibre Specialty Co.					
Old Hick. See Hewitt & Bros., C. B.					
Peerless. See National Vulcanized Fibre Co.					
Rogers Fibre Co., 210 Lincoln, Boston, Mass.				F	
Rogers Paper Mfg. Co., South Manchester, Conn.					B
Schweitzer, Inc., Peter J., 200 Fifth Ave., New York, N. Y. (Condenser Tissue.)					
Seutan Co., 342 Madison Ave., New York			P		
Sirco. See Standard Insulation Co.					
Standard Insulation Co., East Rutherford, N. J.	C	S	P		
Sterling Fireboard Co., 501 Fifth Ave., New York (Varnished Hard Fibreboard)					B
Sterlite. See Sterling Firebrand Co.					
Stevens Paper Mills, Windsor, Conn.					B
Tarentum Paper Mills Co., Tarenium, Pa.			P		
Turbonite. See Brand & Co., Wm.					
Union Mills Paper Mfg. Co., New Hope, Pa.			P		
Warren Mfg. Co., 342 Madison Ave., New York, N. Y.			P		
West Virginia Pulp & Paper Co., 230 Park Ave., New York					B
Wilmington Fibre Specialty Co., Wilmington, Del.			P		

CLUTCHES, Magnetic

Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis.

COIL (Coils).

Armature and Field. See Coils, Finished.
Choke (Power). See Fittings, High Tension.
Choke (Radio). See Radio Circuit Components.
Driers & Impregnators. See Ovens.
Electromagnet. See Coils, Finished.
Flatteners. See Rolls, Coil Flattening.
High Frequency. See Electro-Therapeutic; also Radio Circuit Components; also Ignition Outfits.
Impregnators, Vacuum. See Ovens, Industrial.
Induction. See Coils, Finished; also Electro-Therapeutic.
Loop Benders. See Benders, Coil Loop.
Medical. See Electro-Therapeutic.
Presses. See Presses, Armature Coil.
Radio. See Radio Circuit Components.
Removers. See Removers, Coil.
Resistance. See Units, Rods & Grids; also Radio Circuit Components.
Shaping Machines. See Shaping Machines, Coil.
Spark. See Ignition Outfits.
Spreaders. See Winding Machines, Armature & Field Coil.
Tamping Tools. See Tools, Coil Tamping.
Taping Machines. See Taping Machines, Coil.
Tesla. See Ignition Outfits.
Testers. See Testers, Coil; also Test Benches, Armature
Winders, Armature & Field Coil. See Winding Machines Armature & Field Coil.
Winders, Induction Coil. See Winding Machines, Industrial Coil.
Winding Forms. See Forms, Coil Winding.
Windings (Magneto). See Coils, Finished.
Wire Tension Devices. See Tension Devices, Coil Wire

COILS, Finished

Armature, Field, Electromagnet and Induction Coils
Acme Products Co., Boston, Mass.
Acme Wire Co., New Haven, Conn.
Aero-Coil. See Aero Products, Inc.
Aero Products, Inc., 4611 Ravenswood Ave., Chicago, Ill.
Auth Electrical Specialty Co., 422 E. 53rd St., New York
A. & A. See Electrical Coil Winding Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Bunnell & Co., J. H., 32 Park Place, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.

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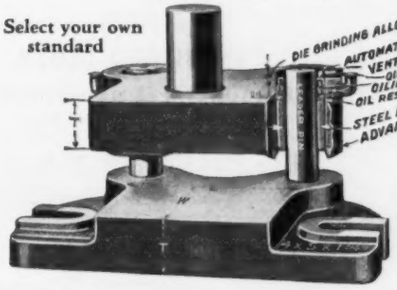

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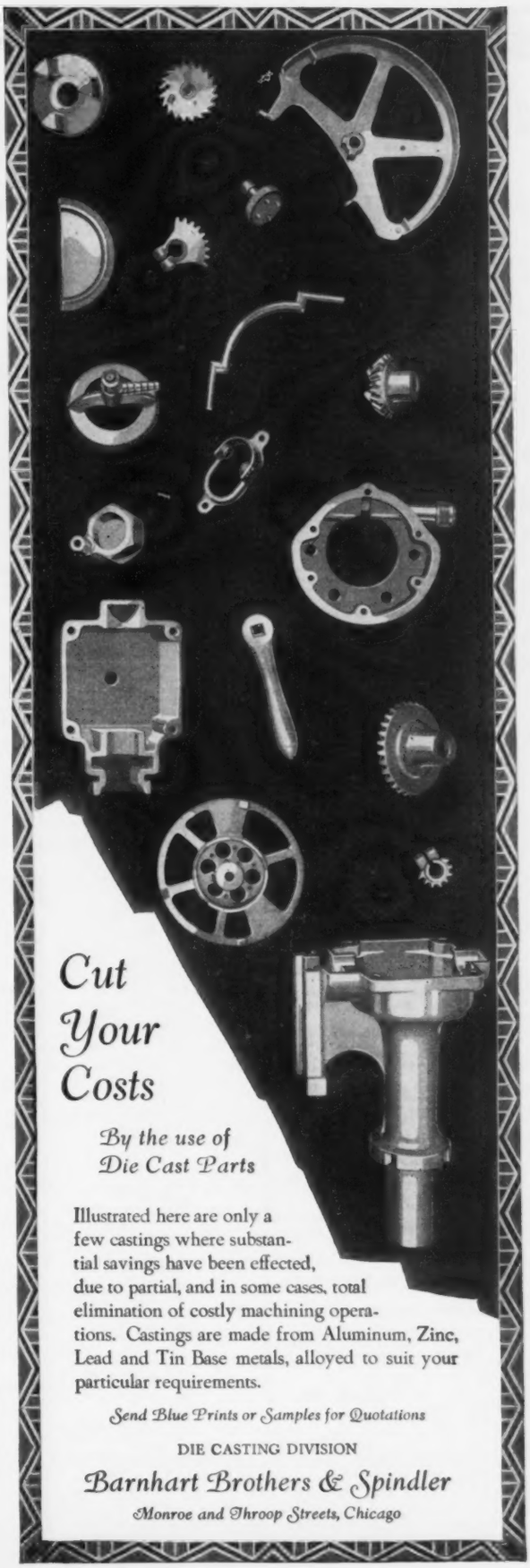

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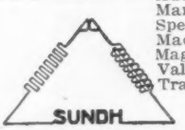
Transfer Switches


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Coto Coil Div. of Universal Winding Co., Providence, R. I.
Ditmar Elec. Co., Brookline, Mass.
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind.
Easton Coil Co., Easton, Pa.
Electric Heat Control Co., 5903 Carnegie Ave., Cleveland, O.
Electrical Coil Winding Co., 2735 Saunders, Camden, N. J.
Electrical Products Mfg. Co., Providence, R. I.
Fredericks Co., H. M., Lock Haven, Pa.
Globe Technolian Corp., Reading, Mass.
Herald Electric Co., 29 East End Ave., New York, N. Y.
Marion Elec. Mfg. Co., 24 Cliff, Jersey City, N. J.
Modern Elec Mfg. Co., 312 Mulberry, Toledo, Ohio.
National Elec. Corp., 228 High, Newark, N. J.
Pifer Elec. Repair & Mfg. Co., 3510 Superior Ave., Cleveland, O.
Polymet Mfg. Co., 599 Broadway, New York, N. Y.
Robertson-Davis Co., 361 W. Superior, Chicago, Ill.
Robertson, Leo F., 536 West 22nd St., New York, N. Y.
Rome Wire Co. (Div of General Cable Corp.), Rome, N. Y
Sevisor Magneto Engrg Co., 397 Phillips, Toledo, O.
Stums & Barron, 310 E. Pratt, Baltimore, Md.
Toledo Standard Commutator Co 2242 Smead Ave., Toledo, O.
Varley Duplex Magnet Co., 15 Exchange Place, Jersey City, N. J. (Electromagnetic only).

COMMUTATOR
Bars. See Bars, Commutator.
Cement. See Cement, Commutator.
Dressers. See Stones, Commutator.
Lubricants. See Compounds, Commutator.
New. See Commutators.
Refilled. See Repairing and Second Hand.
Slotters. See Slotting Machines & Tools, Commutator
Slotting Files. See Files, Commutator Slotting.
Soldering Machines. See Soldering Machines, Commutator
Stones. See Stones, Commutator.
Tighteners. See Tighteners, Commutator.
Truing Devices. See Tools, Commutator Truing.

COMMUTATORS
Derby Commutator Co., Derby, Conn.
Electric Materials Co., North East, Pa.
Eureka Metal Products Corp., North East, Pa.
Homer Commutator Co., Cleveland, Ohio.
COMMUTATOR BRUSHES. See Brushes, Commutator.
COMPOSITION PULLEYS. See Pulleys, Composition.
COMPOUNDS, Sealing. See Wax and Compounds.

CONDENSER UNITS, Refrigerator
Bush Mfg. Co., Hartford, Conn.
McCord Radiator & Mfg. Co., Riorelle & E. Grand Ave., Detroit, Mich.
Rome-Turney Radiator Co., Rome, N. Y.
CONDENSERS, Radio. See Radio Circuit Components.
CONDENSER TUBING. See Tubing, Brass and Copper

CONNECTORS, Pin-Plug
Kliegl Bros. Universal Electric Stage Ltg. Co., 321 W. 50th, New York, N. Y.

CONNECTORS, Wire
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill. (Solderless-Tapeless).
CONTACT POINTS. See Points, Contact.
CONTAINERS, Shipping. See Fibre Board Products.

CONTROLLERS, Motor
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Anderson & Co., C. J., 53 W. Jackson Blvd., Chicago, Ill.
Automatic Switch Co., 154 Grand, New York, N. Y.
Betts, James H., 1393 Sedgwick Ave., New York, N. Y. (Traffic.)
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
B-Q Oil Burner Co., Stockton, Cal.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Condit Elec'l Mfg. Corp., 838 Summer St. (South Boston), Boston, Mass.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Diamond Elect. Mfg. Co., 1330 N. 16th, Los Angeles, Cal.
Dinkey, See Elec. Controller & Mfg. Co.
E C & M Youngstown. See Electric Controller & Mfg. Co.
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland, O.
Electrite. See Sundh Elec. Co.
General Electric Co., Schenectady, N. Y.
Horni Signal Mfg. Corp., 515 Greenwich, New York.
Industrial Controller Div. of Square D Co., S. Pierce & Hanover, Milwaukee, Wis.
Maimin Speed Control Corp., 251 W. 19th, New York. (Sewing Machines.)
Monitor Controller Co., 51 Gay, Baltimore, Md.
National Electric Controller Co., 5315 Ravenswood Ave., Chicago, Ill.
Refrigerating Specialties Co., 728 S. Sacramento Blvd., Chicago, Ill.
Resisto. See Allen-Bradley Co.
Rowan Controller Co., 306 N. Holliday, Baltimore, Md
Square D Co., 6060 Rivard, Detroit, Mich.
Sundh Elec. Co., Parkhurst St. at Ave. C, Newark, N. J
Switcholone. See Condit Elec. Mfg. Co.
Thermaload. See Monitor Controller Co.
Trumbull Electric Mfg. Co., Plainville, Conn.
Uemco. See Union Elec. Mfg. Co.
Unelco. See Union Elec. Mfg. Co.
Union Elec. Mfg. Co., 934 Juneau Ave., Milwaukee, Wis.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
W. K. See Westinghouse Elec. & Mfg. Co.
COPPER. See Brass, Bronze and Copper; also Castings.
COPPER TUBING. See Tubing, Brass and Copper
CORD TIPS. See Tips, Cord.
CORD, Tinsel. See Tinsel Cord & Thread.

CORDS, Extension
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.

CORES, RESISTANCE COIL (Lava)
American Lava Corp., 1425 William, Chattanooga, Tenn
Crescent. See M. Kirchberger & Co.
Es-El-Co. See Southern Lava Co.
Kirchberger & Co., M., 1425 37th, Brooklyn, N. Y.
Lavite. See Steward Mfg. Co.
Lavarock. See M. Kirchberger & Co.
Southern Lava Co., Rossville, Ga.
Steward Mfg. Co., D. M., Chattanooga, Tenn.
Tennessee Burner Mfg. Co., Chattanooga, Tenn.
XL. See Tennessee Burner Mfg. Co.

CORES, RESISTANCE COIL (Refractory Porcelain)
American Lava Corp., 1425 William, Chattanooga, Tenn.
Colonial Insulator Co., Akron, O.
Crowley & Co., Henry L., 545 N. Arlington Ave., East Orange, N. J.
Electrical Refractories Co., East Palestine, O.
Elemite. See Louthan Mfg. Co.
Firelite. See Hartford Faience Co.
Hartford Faience Co., Hartford, Conn.
Louthan Mfg. Co., E. Liverpool, O.
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.
Thermal Syndicate, 58 Schenectady Ave., Brooklyn, N. Y.
Vitreosil. See Thermal Syndicate.
Woolley, Inc., W. Douglas, East Liverpool, O.
COTTON DUCK. See Cloth, Untreated.
COTTON SLEEVING. See Tape, Cotton.
COUNTERS, Revolution. See Tachometers.

COUPLINGS, Shaft (Flexible-Insulated)
Ajax Flexible Coupling Co., Westfield, N. Y.
Bartlett Hayward Co., Baltimore, Md.
Bond Co., Charles, 617 Arch, Philadelphia, Pa.
Brown Engineering Co., 123 N. Third, Reading, Pa.
Delbee Rubber Co., Syracuse, N. Y.
Falk Corp., Milwaukee, Wis.
Francke. See Smith & Serrell.
General Electric Co., Schenectady, N. Y.
Grundy. See Bond Co.
Kanti Lever. See Brown Engineering Co.
Krone-Seebek Die Casting & Mfg. Co., 2935 W. 47th, Chicago, Ill.
Lipe, W. C., Syracuse, N. Y.
Lovejoy Tool Wks., 325 W. Ohio, Chicago, Ill.
Mather. See Bond Co.
Nuttall Wks., of Westinghouse Elec. & Mfg. Co., McCandless Ave. & Harrison St., Pittsburgh, Pa.
Oneida. See Delbee Rubber Co.
Smith & Serrell, 5 Halsey, Newark, N. J.
Webster Mfg. Co., 1856 N. Kostner Ave., Chicago, Ill.
Wood's Sons Co., T. B., Chambersburg, Pa.
COVERING MACHINES, WIRE. See Wire Manufacturing Machines

CUPS, Grease
Bowen Products Corp., Auburn, New York.
Gits Bros. Mfg. Co., 1960 S. Kilbourn Ave., Chicago, Ill.
Lunkenheimer Co., Cincinnati, Ohio.

CUPS, Oil
Gits Bros. Mfg. Co., 1960 S. Kilbourn Ave., Chicago, Ill.
CUT OUTS, Battery. See Switches, Battery.
CUTTING OUTFITS, Metal. See Welding and Cutting Outfits.
CRANES, Floor. See Lifts, Armature.

CRYSTALS, Chandelier
Crystals, Prisms, Beads, Chains, Fringes.
Crystal Venezia. See Harrison & Co., Arthur.
Friedlaender Co., 49 W. 23rd, New York, N. Y.
Harrison & Co., Arthur, 561 W. Washington Blvd., Chicago
Hirschberg, Shutz & Co., 288 4th Ave., New York, N. Y (Fringes.)
Nelson Bead Co., 15 W. 37th, New York, N. Y. (Importer.)
Rialto Import Co., 112 W. 4th, New York, N. Y.
Schwartz Lighting Fixture Wks., 1341 Noble, Philadelphia
Wyle & Bros., J. J., 20 E. 27th, New York, N. Y.
CURRENT INDICATORS. See Instruments, Pocket.
DASHBOARD METERS. See Instruments, Portable and Switchboard.

DECALCOMANIA
Meyercord Co., 120 S. La Salle, Chicago, Ill.
Novar. See Palm Fechteler & Co.
Palm Fechteler & Co., 67 5th Ave., New York, N. Y.

DIALS
Radio (Metal). See Radio Mountings.
Radio (Molded). See Radio Molded Parts.
Enameled. See Dials, Enameled.

DIALS, Enameled
Whittier Co., Horace R., Pequabuck, Conn.
DIAPHRAGM, Cloth. See Cloth, Untreated.
DIE CASTINGS. See Castings, Die.
DIE MAKERS. See Dies, Die Makers.

DIE SETS
Baumbach Mfg. Co., 1810 Kilbourn Ave., Chicago, Ill.
Danly Machine Specialties, Inc., 2104 S. 52nd Ave., Chicago, Ill.
DIES, Pipe. See Stocks, Dies and Reamers.

DIES, DIE MAKERS
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Mareck & Nebel, 255 Greenwich, New York, N. Y.

DISCS, Armature
Steel Discs, Laminations, and Segments for Motors and Transformers.
American Stamping Co., 978 E. 64th, Cleveland, O.
Cleveland Armature Works, 4732 St. Clair Ave., Cleveland
Hercules Elec. Steel Corp., 145 Lafayette, New York, N. Y
Lamination Stamping Co., 764 Windsor, Hartford, Conn.
Willor Mfg. Corp., 117 Mercer, New York, N. Y.
DRAWING MACHINES, WIRE. See Wire Drawing Machines.
DRIVE SCREWS. See Screws, Drive.
DRIVES, CHAIN. See Chain, Power Transmission.

DYNAMOMETERS
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Diehl Mfg. Co., Elizabeth, N. J.
General Electric Co. Schenectady
EBONITE. See Rubber, Hard.
ELECTROLYTE. See Chemicals, Battery.
ELECTROMAGNETS. See Coils, Finished.

ELECTRODES FOR GAS SIGNS
American Neon Sign Corp., 549 W. 132nd St., New York, N. Y.
Eisler Electric Corp., 756 S. 13th, Newark, N. J.
Manhattan Elecl. Supply Co., 510 Sixth Ave., New York.
ELECTRODYNAMOMETERS. See Instruments, Laboratory Standard.
ELEMENTS, Heating. See Units, Rods and Grids.

ENAMELING MACHINES (For Magnet Wire)
(See Also Wire Manufacturing Machines).
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.

ENGRAVING MACHINES
Portable Bench and Pedestal Outfits for Marking Metal.
Brewster Co., Wm., 30 Church, New York, N. Y.
Deckel. See Preis & Co., Inc., H. P.
Eisler Electric Corp., 756 S. 13th, Newark, N. J.
(Tube Base Branders)
Engravograph Corp., 12 Vestry, New York, N. Y.
Etchograph. See Brewster Co., Wm.
Gilbert Supply Co., Independence, Iowa.
Gorton Machine Co., Geo., Racine, Wis.
Preis & Co., Inc., H. P. Newark, N. J.

ENGRAVING, Radio Panel
Engraving to Order.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Etch-O-Gravure. See Insuline Corp. of America.
General Fabricating Co., 165 Greenwich, New York, N. Y.
Globe Mfg. Co., 101 Spokane St., Seattle, Wash.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
New England Products Co., 232 Greenwich, New York.
Preis & Co., Inc., H. P., 227 Fulton, New York, N. Y.
Schwenke Machine Engraving Co., 2035 Woodward Ave., Detroit, Mich.
Varichrome Laboratories, 4614 Spring Grove Ave., Cincinnati.
Wright Radio Co., 114 Exchange, Rockland, Mass.

EYELETS
Platt Bros. & Co., Waterbury, Conn.
Waterbury Brass Goods Co., Waterbury, Conn.
Waterbury Button Co., 835 S. Main, Waterbury, Conn.
FABRIC, Radio Grill. See Cloth, Untreated.
FABRIC SHADES. See Shades, Fabric.
FAN BLADES. See Blades, Fan.

FEET, Felt
Brawley, T. R., 279 20th, Brooklyn, N. Y.

FELT
Advance Felt & Cutting Co., 609 W. Lake, Chicago.
American Felt Co., 211 Congress, Boston, Mass.
Booth Felt Co., 460 18th, Brooklyn, N. Y.
Brawley, T. R., 279 20th, Brooklyn, N. Y.
Western Felt Wks., 4029 Ogden Ave., Chicago, Ill.

FERRULES
Chase Brass & Copper Co., Waterbury, Conn.
Clark Metal Products, 490 Hancock Ave., Bridgeport, Conn.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Massachusetts Machine Shop, Inc., Boston, Mass.
Patton-MacGuyer Co., Providence, R. I.
Platt Bros. & Co., Waterbury, Conn.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., 99 Mill, Waterbury, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., Waterbury, Conn.

FIBRE BOARD PRODUCTS (Solid and Corrugated)
Container Corp. of America, 111 W. Washington, Dept. 36, Chicago, Ill.
Mid-West Box Co., 111 W. Washington, Chicago.
Serton Mfg. Corp., 59 E. Madison, Chicago, Ill.
FIBER CANDLES. See Candles, Fixture.
FIBRE GEARS. See Gears and Pinions, Composition.
Paper. See Cloth and Paper.
Radio Panels. See Radio Molded Parts.
Shipping Containers. See Fibre Board Products.
Vulcanized. See Fibre, Vulcanized.

FIBRE, Phenol
Moisture Proof: Sheet, Rod, Tubes.
Armite. See Spaulding Fibre Co.
Bakelite-Dilecto. See Continental Fibre Co.
Campbell Fibre Co., Heather Ave., Stanton, Del.
Campbellite. See Campbell Fibre Co
Celoron Co., Div. of Continental-Diamond Fibre Co. Bridgeport, Pa.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Fibroc Insulation Co., 245 Lincoln Ave., Valparaiso, Ind.
Formica Insulation Co., 4626 Spring Grove Ave., Cincinnati, O.
Franklin Fibre Specialty Co., Wilmington, Del.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Phenolite. See National Vulcanized Fibre Co.
Spaulding Fibre Co., Tonawanda, N. Y.
Synthane Corp., Oaks, Pa.
Vul-Cot. See National Vulcanized Fibre Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

FIBRE, Vulcanized
Sheet, Rod, Tube, Horn, Fibre, Bushings, Washers, Cleats, Screw Machine Products.
Brandywine Fibre Products Co., 1402 Walnut St., Wilmington, Del.

To Make Sure of Your Moldings

THE success of your moldings lies in your own control far beyond the reach of design and application.

Should you require a new shaft for your most important golf club—would you simply specify material and dimensions and depend upon getting a superlative shaft from any chance club-maker? You would not.

And in getting the kind of moldings that you must have, your safest course is to select a molding plant of known and demonstrated outstanding ability.

In arranging for International molding service you make certain of this. A service backed by experience in its own right that is almost as old as molding itself. Experience, too, that is as broad as the whole range of molding activity. Added to this, the best of modern equipment and year-'round geared-up full capacity production for the largest and most exacting users of moldings.

International's service includes every molding requirement—completely handled in our own plant. Estimates furnished without obligation.

International molding service is known for meeting customers' delivery dates. Our heavy production requires constantly efficient operating.

PRECISION MOLDERS OF BAKELITE AND SHELLAC COMPOSITION

INTERNATIONAL INSULATING CORPORATION

Division of The General Industries Co.

ESTABLISHED 1875 ELYRIA, OHIO

FIBRE, Vulcanized—Continued
Conite. See Continental-Diamond Fibre Co.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Delaware Hard Fibre Co., Wilmington, Del.
Diamond F. See Continental-Diamond Fibre Co.
Egyptian. See Delaware Hard Fibre Co.
Electrosote. See Pantasote Co.
Fibro Products Co., New Bedford, Mass.
Franklin Fibre Specialty Co., Wilmington, Del.
Fyberoid. See Wilmington Fibre Specialty Co.
Independent Laboratories, 50 E. 42nd, New York, N. Y.
Iten Fibre Co., 5403 Bower Ave., Cleveland, O.
Leatheroid. See Rogers Fibre Co.
Lincoln Fibre & Specialty Co., Newport, Del.
National Vulcanized Fibre Co., Wilmington, Del.
Ohmoid. See Wilmington Fibre Specialty Co.
Pantasote Co., Inc., 250 Park Ave., New York, N. Y.
Peerless. See National Vulcanized Fibre Co.
Rogers Fibre Co., 210 Lincoln, Boston, Mass.
Spaulding Fibre Co., Tonawanda, N. Y.
Standard Fibre Products Co., 36 Pleasant, Watertown, Mass
Vul-Cot. See National Vulcanized Fibre Co.
Vulcawood. See Continental-Diamond Fibre Co.
Wilmington Fibre Specialty Co., Wilmington, Del.
FIBRE WASHERS. See Fibre.
FIELD COILS. See Coils, Finished.

FILAMENTS, Incandescent Lamp

Cohn, Sigmund, 44 Gold, New York, N. Y.
Conneway Elec. Laboratories, 406 Jefferson St., Hoboken.
Filament Supply Co., 1317 Willow Ave., Hoboken, N. J.
Gilby Wire Co., Riverside Ave., Newark, N. J.
National-Harris Wire Co., 195 Verona Ave., Newark, N. J.
Suter & Nuezzi, 3709½ Lisbon Ave., Milwaukee, Wis.
Vacuum Tube Products, Steneck Trust Bldg., Hoboken, N. J.
Volkmar & Sons, 187 Sylvan Ave., Newark, N. J. (Lead-in-Welds.)

FILES, Commutator Slotting

Ideal Commutator Dresser Co., 1039 Park, Sycamore, Ill.
Martindale Electric Co., 1262 W. Fourth, Cleveland, O.
FISH PAPER. See Cloth and Paper.
FITTINGS, Fixture. See Fixture Fittings.
FIXTURE CANDLES. See Candles, Fixture.
FIXTURE CHAIN. See Chain, Fixture.
FIXTURE, Collars. See Fixture Fittings.

FIXTURE FITTINGS

	KEY
Bowl Holders	See B
Brass Fittings	See B
Canopies	See B
Collars	See B
Crow Feet	See I
Finials (Brass, Glass and Porcelain)	See B
Hangers	See H
Hickies, Brass	See B
Hickies, Iron	See I
Hooks, Brass	See B
Hooks, Iron	See I
Iron Fittings	See I
Loops, Brass	See B
Loops, Iron	See I
Rings	See B
Shade Holders	See S
Shells	See B
Spinnings	See B
Stampings	See B
Stems	See B
Straps	See H
Studs	See I

Acme Lighting Products, Inc., 2114 Woodland Ave., Cleveland, O. Straps . . . . . B
American Chain Co., Bridgeport, Conn. (Loops and Rings.) . . . . . B . . . .
American Ring Co., Waterbury, Conn. (Candle.) . . . . S . .
Appleton Electric Co., 1703 Wellington Ave., Chicago, Ill. . . . . B I . . . .
Arco. See American Ring Co.
Arrow Electric Division of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. . . . . S . .
Artoloid. See Great Eastern Brass Wks., Inc.
Art Metal Co., 3721 Dayton, Cleveland, O. . . . . H
Banlite. See East Side Metal Spinning Co.
Banner. See Plume & Atwood Mfg. Co.
Barton Brass Wks., 3627 Superior, Detroit . . B . . . . .
Belmet. See B. & L. Metal Stamping Co.
Bloch Bros., 88 Walker, New York . . . . . B . . . . .
Brandt Mfg. Co., 3727 Gratiot Ave., Detroit. B . . . . .
Braun, J. G., 609 S. Pauline, Chicago, Ill. (Pressed Ornaments.) . . . . . B I . . . .
B. & L. Metal Stamping Co., 250 Moore, Brooklyn, N. Y. (Also Combination Wall Bracket Hanger.) . . . . . B I . . H
Cambridge Brass Co., Cambridge, Mass. . . . . B . . . .
Chase Brass & Copper Co., Waterbury, Conn. B . . S . .
Chatham Metal Spinning & Stamping Corp., 128 Mott, New York, N. Y. . . . . B I . . . .
Cleanezy. See Dunlap Co.
Colonial Stamping Co., Brill St. & Passaic Ave., Newark, N. J. . . . . B . . S . .
Crescent Brass Mfg. Co., Reading, Pa. . . . . B . . . . .
Crouse-Hinds, Solvay Sta., Syracuse, N. Y. . . . . S H
Diamond Needle & Mfg. Co., Torrington, Conn. (Hickies.) . . . . . I . . . .
Dunlap Co., John, Carnegie, Pa. . . . . S . .
East Side Metal Spinning Co., 451 Greenwich, New York, N. Y. . . . . B . . . . .
Eureka Tin Ware Mfg. Co., 135 W. 20th, New York, N. Y. . . . . S . .
E-Z Up. See Plume & Atwood Mfg. Co.
Faries Mfg. Co., Decatur, Ill. . . . . B I S H
Flaherty Co., M. E., 28 S. Clinton, Chicago. . . I . . . .
Fralick Co., S. R., 15 S. Clinton, Chicago. . . I . . . .
Franklin Brass Foundry Co., Reading, Pa. . . . R . . . . .
Friedley-Voehardt Co., Chicago. . . . . B . . . . .
Grabler Mfg. Co., 6565 Broadway, S. E., Cleveland, O. . . . . I . . . .
Great Eastern Brass Wks., Inc., 182 Grand, New York, N. Y. (Spindles).
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. . . . . S . .
Incandescent Supply Co., 468 West Broadway, New York, N. Y. . . . . B . . . H
Isco. See Incandescent Supply Co.
Jiffy. See White Mfg. Co., J. H.
Kwikon. See Fralick Co., S. R.
Lakin. See Thomas & Betts Co.
Liberty Brass Turning Co., 88 Walker, New York, N. Y. . . . . I . . . .
Liberty Iron Pipe & Nipple Works, 62 Greene, New York, N. Y. . . . . B I . . . .
Liberty Machine Co., Wauwatosa, Wis. . . . . B I . . . .
Light Metal Stamping Co., 310 13th St., West New York, N. J. . . . . S . .
L & K Mfg. Co., 440 Adelphi, Brooklyn, N. Y. . . . . H
L. & W. Brass Wks., 381 W. Superior, Chicago, Ill. . . . . B . . . . .
Madelite. See Belson Mfg. Co.
M. S. W. Mfg. Co., 1527 Niagara Ave., Buffalo, N. Y. . . . . I . . . .
Meta. Products Co., 210 Canal, New York . . . . B . . . . .
Metro Iron Ornament Co., 191 Christie, New York, N. Y. . . . . I . . . .
Metropolitan-Columbia Mfg. Co., 714 Metropolitan Ave., Brooklyn, N. Y. . . . . B . . . . .
Midwest Elec. Co., 1639 Walnut, Chicago, Ill. . . I . . . .
Mid-West Chandelier Co., 14th & Chestnut Sts., Kansas City, Mo. . . . . B . . . . .
Michell-Vance Co., 79 Washington, Brooklyn, N. Y. . . . . S . .
Monarch. See Perfeclite Co.
Murlin Mfg. Co., Philadelphia, Pa. . . . . B I . . . .
National Electric Products Corp., Pittsburgh, Pa. (Studs.) . . . . . I . . . .
New Era Elec. Mfg. Co., 6725 Machinery Ave., N. E., Cleveland, O. . . . . H
New Wrinkle. See Bryant Elec. Co.
New York Brass Turning Co., 563 Broadway, New York, N. Y. . . . . B . . . . .
Nobolt. See Fralick & Co., S. R.
N. W. Cleat Receptacle Bracket, 2437 N. 29th, Philadelphia, Pa. . . . . I . . . .
Onli. See Perfeclite Co.
Pass & Seymour, Solvay Sta., Syracuse, N. Y. B . . S . .
Perfeclite Co., 1457 E. 40th, Cleveland. . . . . S . .
Pittsburgh Valve & Fittings Co., Barberton, O. . . I . . . .
Plume & Atwood Mfg. Co., Waterbury, Conn. B . . S H
Plumwood. See Plume & Atwood Mfg. Co.
Plymouth. See Vester Sons, Alfred.
Products Machine Co., Bridgeport, Conn. . . . . B . . . . .
Reading Brass Co., 141 Schuller, Reading, Pa. B I . . . .
Ribaysen Mfg. Co., J., 952 W. Lake, Chicago, Ill. B . . . .
Rodale Mfg. Co., 200 Hudson, New York . . . . B . . . H
Sandow Tool Co., 1440 Bway, New York, N. Y. . . . S . .
Scovill Mfg. Co., Waterbury, Conn. . . . . B I . . . .
Simpalite. See Sprecher Mfg. Co., P. W.
Simplex. See Plume & Atwood Mfg. Co.
Springfast. See Plume & Atwood Mfg. Co.
Square-G. See Grabler Mfg. Co.
Standard Snap-Lite Corp., 504 Jackson Ave., Long Island City, N. Y. . . . . S . .
Standard Metal Spinning Co., 128 Mott, New York, N. Y. . . . . B . . . . .
Star. See Perfeclite Co.
Star. See Steel City Elec. Co.
Steel City Elec. Co., Pittsburgh, Pa. . . . . I . . . .
Steele & Johnson Mfg. Co., Waterbury, Conn. B . . S . .
Stembridge & Brandt, 29 S. Clinton, Chicago, Ill. (White Metal.) . . . . . B . . . . .
Sterling Spinning & Stamping Wks., 476 Broome, New York, N. Y. . . . . B . . . . .
T. & B. See Thomas & Betts Co.
Thomas & Betts Co., 63 Vesey, New York . . . . I . . . .
Uno. See Bryant Elec. Co., also Crouse-Hinds, also General Elec. Co., also Hart & Hegeman Mfg. Co., also Pass & Seymour.
United. See L & K Mfg. Co.
United Metal Spinning Co., 440 Adelphi, Brooklyn, N. Y. . . . . B . . . . .
Vester, Sons, Alfred, 5 Mason, Providence, R. I. B . . . . .
Victor. See Plume & Atwood Mfg. Co.
Virden, Div. of Gill-Virden Co., 6108 Longfellow Ave., Cleveland, O. . . . . B . . . . .
Walden Tool & Metal Mfg. Co., New Haven Conn. . . . . .
Wameco. See Waterbury Metal Wares Co.
Waterbury Co., Waterbury, Conn. . . . . B . . . . .
Waterbury Metal Wares Co., Waterbury, Conn. . . . S . .
Weber Brass Co., Whitney Power Block, Cleveland, O. . . . . B . . . . .
White Diamond. See White Mfg. Co., J. H.
White Mfg. Co., J. H., 79 Madison Ave., New York, N. Y. . . . . B . . S . .
Wilhite Machine Wks., 1245 S. Hope, Los Angeles, Cal. . . . . B . . . . .

FLASHERS, Sign

Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.
Ajax. See Reynolds Spring Co.
A. & W. See General Outdoor Adv. Co.
Angelus. See Electric Sign Flasher Corp.
Betts, Inc., James H., 1393 Sedgwick Ave., New York. (Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.)
Betts & Betts Corp., 645 W. 43rd, New York, N. Y. (Motor Flashers.) (Thermal Flashers.) Flashing Plugs.)
California Sign Flasher Co., 230 Guttenberg, San Francisco Cal.
Commercial Elec. Co., 1203 E. Grant, Portland, Ore.
Cramblet Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Diamond. See General Appliance Corp.
Dominic. See Kala-Flasher Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electric Signal Corp., 406 Fourth Ave., Seattle, Wash.
Electric Sign Flasher Corp., 1826 W. 9th, Los Angeles, Cal.
Figuregram. See Reynolds Electric Co.
Flash O-Lite. See Betts, Inc., James H.
Flip-Flop. See Betts, Inc., James H.
Gem Engineering Co., Hempstead, N. Y.
Gacor. See General Appliance Corp.
General Appliance Corp., 120 8th, San Francisco, Cal. (Flasher Button.)
General Controler Co., 200 E. First, Dayton, O.
Grazier Elec'l Products Co., Johnstown, Pa.
Horni Signal Mfg. Co., 516 Greenwich, New York, N. Y.
Jimbetts. See Betts, Inc., James H.
Kala-Flasher Co., 344 N. Church, Kalamazoo, Mich.
Killark. See Betts & Betts Corp.
Kontroler. See General Controler Co.
Mercury. See Betts, Inc., James H.
Opalume Sign System, Battle Creek, Mich.
Phelps Elec. Co., 29 S. Clinton, Chicago, Ill. (Motorless)
Phoenix Products Co., Phoenix, N. Y.
Presto Products Co., 64 University Place, New York, N. Y. (Sockets and Plugs.)
Reco. See Reynolds Elec. Co.
Reynolds Elec. Co., 2650 W. Congress, Chicago, Ill.
Reynolds Spring Co., Jackson, Mich.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Ryan. See Phoenix Products Co.
Skedoodle. See Phelps Elec. Co.
Sokit. See Betts, Inc., James H.
Thermo-Wynk. See Betts & Betts Corp.
Vacu. See Betts & Betts Corp.
Veebar. See Betts, Inc., James H.
Way, Eugene W., Seattle, Wash.
Wood Electric Co. C. D., 565 Broadway, New York N. Y.
Woodwin. See Wood Elec. Co., C. D.
Wynk-A-Lyte. See Betts & Betts Corp.
FLASHLIGHT LENSES. See Lenses.
FLEXIBLE ARMS. See Tubing, Flexible Metallic.
FLEXIBLE LEADS, Commutator Brush. See Brushes, Commutator.

FLEXIBLE SHAFT MACHINES

(For shafting. See Tubing, Flexible Metallic.)
Strand & Co., N. A., 5001 N. Lincoln, Chicago, Ill.

FORGINGS, Non-Ferrous

Scovill Mfg. Co., Waterbury, Conn.

FORMS, Coil Winding

Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, O.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Master. See Armature Coil Equipment Co.

FORMS, Wire

Forms and Frames for Shade Holders and Shades: Bending, Welding, Forming.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Arrow Wire Frame Corp., 344 E. 23rd, New York, N. Y.
Blake & Johnson Co., Waterbury, Conn.
Central Wire Frame Co., 154 E. 23rd, New York, N. Y. (Complete with socket, cord and plug.)
Chelsea Wire Wks., 675 Hudson, New York, N. Y.
Clark Metal Products Inc., 490 Hancock Ave., Bridgeport Conn.
City Wire Frame Co., 2025 S. Michigan Ave., Chicago.
Electro Weld Co., 70 Munroe, Lynn, Mass.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Jeschke Wire Specialty Wks., Crawfordsville, Ind.
Kriechev & Mfg. Co., 255 Calyer, Brooklyn, N. Y.
Manhattan Wire Products Co., 398 First Ave., New York.
Murray Hill Wire Frame Co., 314 E. 32nd, New York, N. Y.
Roebling's Sons Co., John A., Trenton, N. J.
Steinen & Co., 297 Washington, Newark, N. J.
Watral & Sons, 133 E. 16th, New York, N. Y.
Young Industries, Inc., L. A., Detroit, Mich.
FRAMES, Wire. See Forms, Wire.
FRICTION TAPE. See Tape, Rubber and Friction.
FRINGE, Chandelier. See Crystals, Chandelier.

FUSE CLIPS

Sherman Mfg. Co., H. B., Battle Creek, Mich.
Waterbury Brass Goods Co., Waterbury, Conn.
FUSE TESTERS. See Testers, Fuse and Circuit.

FUSES AND FUSE WIRE

	KEY
Cartridge	See C
Plug	See P
Non-Refillable	See N
Refillable	See R
Open Link	See O
Fuse Wire	See O

Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. . . . . P . . . . .
Arkless. See Economy Fuse Mfg. Co.
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. . . . . P N . . . .
Automatic Elec. Iron & Fuse Co., 215 S. American, Philadelphia, Pa. . . . . P . . . . .
Blue Ribbon. See Royal Elec. Co.
Buss. See Bussman Mfg. Co.
Bussmann Mfg. Co., University & Jefferson Ave., St. Louis . . . . . C P N R O
Chase-Shawmut Co., Newburyport, Mass. . . C P N R O
Clearsite. See Economy Fuse & Mfg. Co.
Clear-Top. See Trico Fuse Mfg. Co.
Colortop. See Trico Fuse Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. (Automobile) . . . . . C . . N R . .
Cote Bros. Mfg. Co., 182 W. Lake, Chicago C P . . R . .
Crystal. See Royal Elec. Co.
Daum Fuse & Elec. Mfg. Co., 1157 Hodgkiss, Pittsburgh . . . . . C . . . . R . .
D. & W. See Graybar Electric Co.
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. . . . . C P N R . .
Eco. See Economy Fuse & Mfg. Co.
Electric Fuseguard Co., Charlottesville, Va. . C P N R . .
Elliott Electric Co., Shreveport, La. . . . . .
Gem. See Chicago-Jefferson Fuse & Electric
General Elec. Co., Merchandise Dept., Bridgeport, Conn. . . . . C P N R . .
Graybar Electric Co., Graybar Bldg., Lexington Ave. and 43rd St., New York, N. Y. C . . . . . .
Great Western Fuse Co., 415 Lexington Ave., New York, N. Y. . . . . C . . . . R . .
H. & H. See Hart & Hegeman.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. . . . . P . . R . .
Hudson Wire Co., Ossining, N. Y. . . . . O
Kantark. See Trico Fuse Mfg. Co.
Kirkman Engrg. Co., 1 Dominick St., New York, N. Y. . . . . C P N . . O
Littelfuse Laboratories, 1772 Wilson Ave., Chicago, Ill. (Low Capacity, Glass Enclosed, 025 to 2 Amp.) . . . . . .
Monarch Fuse Co., 116 E. First, Jamestown, N. Y. . . . . C . . N R . .
National. See Economy Fuse & Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Pierce Renewable Fuses, Inc., 732 Main, Buffalo, N. Y. . . . . C P . . R . .
Platt Bros. & Co., Waterbury, Conn. . . . . O
Powell, F. W., 119 W. Ohio, Pittsburgh. . . P . . R . .
Ree-Nu-It Elec. Co., New Bedford, Mass. . C P . . R . .
Rochester Re-Fill Fuse Co., 402 Cottage, Rochester, N. Y. . . . . C . . . . R . .
Royal Elec. Co., Chelsea Station, Boston. . . P N . . . .
Shawmut. See Chase-Shawmut Co.
Simplicity. See Cote Bros. Mfg. Co.
Six-In-One. See Industrial Engrg. Co.
Star Fuse Co., 235 Canal, New York, N. Y. C P . . R . .
Trico Fuse Mfg. Co., 1001 McKinley Ave., Milwaukee . . . . . C P N R . .
Union. See Chicago-Jefferson Fuse & Electric

GALVANIZING

Cattle & Bros., Joseph P., Gaul and Latterly Sts., Philadelphia, Pa.
GALVANOMETERS. See Instruments, Laboratory Standard.

GAS, Inert

Bozium Co., Louisville, Ky.
Palatine Industrial Co., 111 Fifth Ave. New York N. Y.
Weber, Alfred, 5 Union Square, New York, N. Y.

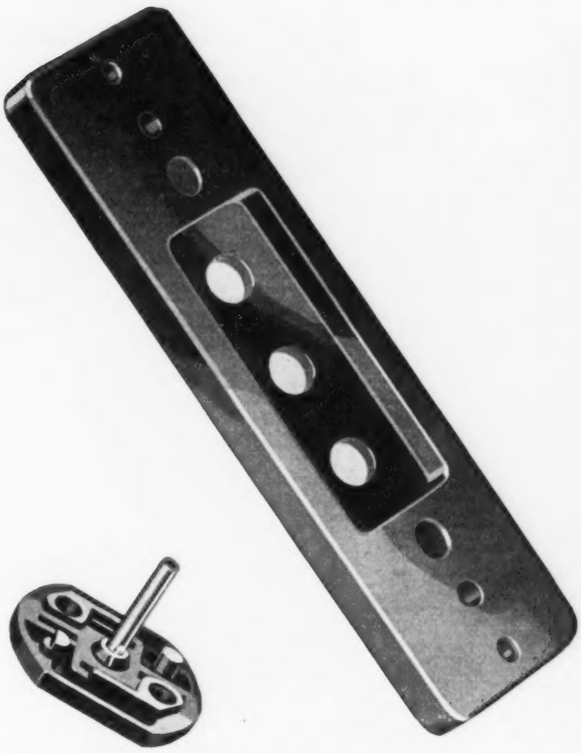
GAS SIGN ELECTRODES. See Electrodes for Gas Signs

GASKETS, Rubber

Gutta Percha & Rubber Mfg. Co., 15 Park Row, New York.
Canfield Rubber Co., Bridgeport, Conn.
GAUZE BRUSHES, Wire. See Brushes, Commutator
GEARS, Fibre. See Gears and Pinions, Composition.

GEARS (Speed Changing Units)

Cleveland Worm & Gear Co., Cleveland, Ohio.
Cullman Wheel Co., 1346 Altgild, Chicago, Ill.
De Laval Steam Turbine Co., Trenton, N. J.
Falk Corp., Milwaukee, Wis.
Farrell-Birmingham Co., 344 Vielcan, Buffalo, N. Y.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago, Ill
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
James Mfg. Co., D. O., Chicago, Ill.
Janette Mfg. Co., 556 W. Monroe, Chicago, Ill.
Jones Pdy. & Machine Co., W. A., Chicago, Ill.
Lipe, W. C., Syracuse, N. Y.



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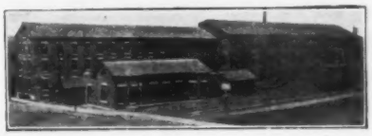

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GEARS (Speed Changing Units)—Continued
Nuttall Wks., of Westinghouse Elec. & Mfg. Co., McCandless Ave. & Harrison St., Pittsburgh, Pa.
Palmer-Bee Co., Detroit, Mich.
Ohio Gear Co., 1333 E. 179th, Cleveland, Ohio.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Philadelphia Gear Works, Richmond and Tioga Sts., Philadelphia, Pa.
Smith, Winfield H., Springville, N. Y.

GEARS, Worm

Albaugh-Dover Mfg. Co., Chicago, Ill.
Cleveland Worm & Gear Co., Cleveland, Ohio.
Colburn Gear & Mfg. Co. (Norfolk Downs), Quincy, Mass.
Ohio Gear Co., 1333 E. 179th, Cleveland, Ohio.
Philadelphia Gear Works, Richmond and Tioga Sts., Philadelphia, Pa.

GEARS AND PINIONS, Composition

Chicago Stock Gear Wks., 105 S. Jefferson, Chicago, Ill.
Celoron Co., Div. of Continental-Diamond Fibre Co., Bridgeport, Pa.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Delaware Hard Fibre Co., Wilmington, Delaware.
Fabroil. See General Elec. Co.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago, Ill.
Franklin Fibre Specialty Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Medart Co., St. Louis, Mo.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Stahl Gear Co., 1390 E. 40th, Cleveland, Ohio.
Stranahan Gear Co., Philadelphia, Pa.
Textoil. See General Electric Co.
Textolite. See General Electric Co.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GEARS AND PINIONS, Iron and Steel

Earle Gear & Machine Co., Wayne Junction, Philadelphia.
Falk Corp., Milwaukee, Wis.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
James Mfg. Co., D. O., Chicago, Ill.
Medart Co., St. Louis, Mo.
Meisel Bros. Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Permag. See Perkins Machine.
Tool Steel Gear & Pinion Co., Cincinnati, Ohio.

GEARS AND PINIONS, Rawhide

Chicago Rawhide Mfg. Co., 1313 Elston Ave., Chicago, Ill.
Gordes & Co., 50 Church, New York, N. Y.
Syracuse Rawhide Mfg. Co., Syracuse, N. Y.
Western Rawhide & Belting Co., Milwaukee, Wis.

GENERATORS, Electroplating. See Plating Generators

GLASS BULBS. See Bulbs, Glass.

GLASS CANDLES. See Candles, Fixture.

GLASS LETTERS. See Letters, Sign.

GLASS for Electrical Purposes

Corning Glass Wks., Corning, N. Y.
Pyrex. See Corning Glass Wks.

GLASSWARE

Alba. See Macbeth-Evans Glass Co.
Amazon. See Gleason-Tiebout Glass Co.
Amelites. See Consolidated Lamp & Glass Co.
Apollo. See Gillinder Bros., Inc.
Ardmore. See Jeannette Shade & Novelty Co.
Aurene. See Corning Glass Co.
Aurora. See Consolidated Lamp & Glass Co.
Bayley Sons, 105 Vanderveer, Brooklyn, N. Y.
Beaumont Co., Morgantown, W. Va.
Bellova. See McFaddin & Co., H. G.
Blanco. See Gleason-Tiebout Glass Co.
Beryllite. See Plaut & Co., L.
Bostock, Rhodes & Co., 11 N. Moore, New York, N. Y.
Camia. See Gleason-Tiebout Glass Co.
Carara. See Gleason-Tiebout Glass Co.
Celestialite. See Gleason-Tiebout Glass Co.
Chesler & Sons Co., J., 45 Varick Ave., Brooklyn, N. Y.
Clearcut. See Ivanhoe Division of Miller Co.
Colcite. See Corning Glass Co.
Consolidated Lamp & Glass Co., Coraopolis, Pa.
Cora. See Consolidated Lamp & Glass Co.
Cora-Lites. See Consolidated Lamp & Glass Co.
Corning Glass Co., Corning, N. Y.
Cremax. See Macbeth-Evans Glass Co.
Crystal. See Phoenix Glass Co.
Daylite. See Wells Glass Co.
Delica-White. See Kopp Glass, Inc.
Druid. See Ivanhoe Division of Miller Co.
Eagle Mfg. Co., Wellsburg, W. Va.
Emeralite. See McFaddin, H. G.
Equalite. See Bayley & Sons.
Erskine Glass & Mfg. Co., Wellsburg, W. Va.
Federal Light & Lens Corp., Star City, W. Va.
Florentine. See Gleason-Tiebout Glass Co.
Geneo. See Ivanhoe Division of Miller Co.
Gillinder Bros., Inc., Port Jervis, N. Y.
Gillinder & Sons, Inc., Philadelphia, Pa.
Gleason-Tiebout Glass Co., 99 Commercial, Brooklyn, N. Y.
Gletieco. See Gleason-Tiebout Glass Co.
Havana. See Kopp Glass, Inc.
Hocking Glass Co., Lancaster, O.
Holophane Co., 342 Madison Ave., New York, N. Y.
Imperial Glass Co., Bellaire, O.
Inland Glass Works, Chicago, Ill.
Ivanhoe Division of Miller Co., Cleveland, Ohio.
Ivory. See Phoenix Glass Co.
Ivre. See Ivanhoe Division of Miller Co.
Jeannette Shade & Novelty Co., Jeannette, Pa.
Jefferson Glass Co., Follansbee, W. Va.
Kaufield Glass & Ceramic Co., Star City, W. Va.
Kopp Glass, Inc., Swissvale, Pa.
Lumina. See Hocking Glass Co.
Luminite. See Macbeth-Evans Glass Co.
Macbeth-Evans Glass Co., Dept. G, Eastern Division, Charlerol, Pa.
Magnolia. See Phoenix Glass Co.
McFaddin & Co., H. G., 38 Warren, New York, N. Y.
Mellilite. See Gillinder & Sons, Inc.
Micro. See Gillinder & Sons, Inc.
Miller Co., Meriden, Conn.
Monax. See Macbeth-Evans Glass Co.
Moonstone. See Jefferson Glass Co.
N. B. G. See Gillinder & Sons, Inc.
N. U. Glass. See Gillinder & Sons, Inc.
Nebulite. See Gillinder & Sons, Inc.
Nemalite. See Gillinder & Sons, Inc.
Nitro-Glas. See Jefferson Glass Co.
Nuart. See Imperial Glass Co.
Nulite. See Consolidated Lamp & Glass Co.
Nutralux. See Kopp Glass, Inc.
Opalux. See Gleason-Tiebout Glass Co.
Opola. See Inland Glass Co.
Oplex. See Kaufield Glass & Ceramic Co.
Pastelle. See Consolidated Lamp & Glass Co.

Pearltone. See Inland Glass Co.
Persian. See Gillinder & Sons, Inc.
Phoenix Glass Co., Monaca, Pa.
Pilkington. See Kopp Glass, Inc.
Pittsburgh Cut Glass Co., Monaca, Pa.
Plaut & Co., L., 432 E. 23rd, New York, N. Y.
Poly-Case. See Gleason-Tiebout Glass Co.
Prestopal. See Gleason-Tiebout Glass Co.
Quezal Glass Mfg. Co., Fresh Pond Rd. and Metropolitan Ave., Brooklyn, N. Y.
Radiant. See Phoenix Glass Co.
Regent. See Ivanhoe Division of Miller Co.
Rezelle. See Ivanhoe Division of Miller Co.
Rosedora. See Consolidated Lamp & Glass Co.
Shade-O-Tone. See Consolidated Lamp & Glass Co.
Snow-White. See Inland Glass Works.
Soloman & Son, Inc., L., 199 Wooster, New York, N. Y.
Star Glass Co., Star City, W. Va.
Sudan. See Ivanhoe Division of Miller Co.
Thebian. See Macbeth-Evans Glass Co.
Translux. See Kopp Glass, Inc.
Trojan. See Ivanhoe Div. of Miller Co.
United Novelty Glass Mfg. Co., 121 Prince, New York, N. Y.
Utopia. See Kopp Glass, Inc.
Velaria. See Ivanhoe Division of Miller Co.
Vineland Flint Glass Wks., Vineland, N. J.
Wells Glass Co., Kokomo, Ind.
Williamsburg Flint Glass Co., 290 Broadway, New York.
Yural. See Ivanhoe Division of Miller Co.
Zanesville Mould Co., Zanesville, O.

GONGS, Unmounted Shells

Bevin Bros. Mfg. Co., East Hampton, Conn.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
East Hampton Bell Co., East Hampton, Conn.
Gong Bell Mfg. Co., East Hampton, Conn.
Hill Brass Co., M. N., East Hampton, Conn.
Liberty Bell Mfg. Co., Minerva, O.
Reiter, G. C., Canton, O.

GRAPHITE BEARINGS. See Bearings, Oil-less.

GRID LEAKS. See Radio Circuit Components.

GRIDS, Resistance. See Units, Rods and Grids.

GRILL CLOTH. See Cloth, Untreated.

GRINDERS, Commutator. See Tools, Commutator Truing.

GROMMETS. See Eyelets.

GROUND LOCATORS. See Instruments, Portable and Switchboard: also Testers, Coil.

GROWLERS, Armature. See Testers, Coil.

HANDLES, Wood; For Switches or Sad Irons

Allen, Chas. E., Pequabuck, Conn.
American Enamel Co., 20 Neville, Providence, R. I.
Bogert & Hopper, 225 Varick, New York, N. Y.
Estes & Son, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Fitchburg Enamel Co., Fitchburg, Mass.
Flanders Hardware Co., North Weare, N. H.
Fuller, J. J. Westfield, Mass.
Narragansett Mach. Co., Pawtucket, R. I.
National Wood Process, New Bedford, Mass.
Novelty Turning Co., Norway, Me.
Ober Mfg. Co., Chagrin Falls, O.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Piqua Handle & Mfg. Co., Piqua, Ohio.
Royal Enamel Co., Fitchburg, Mass.
Schutz Bros., 152 Chambers, New York, N. Y.
Stiles & Co., H. A., 174 Portland, Boston, Mass.
Stratton Mfg. Co., Stratton, Maine.
Sun Enamel Wks., Leominster, Mass.

HOLDERS, Brush. See Brushes, Commutator.

HOT WIRE METERS. See Instruments, Portable and Switchboard.

IMPREGNATING COMPOUNDS. See Wax and Compounds

IMPREGNATING, VACUUM. See Ovens, Industrial.

INCANDESCENT LAMP BULBS (Unfinished). See Bulbs, Glass.

INCANDESCENT LAMP FILAMENTS. See Filaments, Incandescent Lamp.

INDICATORS, Operation

Operation and Cost Indicators for Manager's Office.
Bristol Co., Waterbury, Conn. (Elapsed Time Recorder.)
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Production Meter Co., 1315 S. Wabash Ave., Chicago, Ill.

INDUCTION COILS. See Coils, Finished.

INSTRUMENT, Jewels. See Jewels.

INSTRUMENTS, Laboratory Standard. See Instruments, Laboratory Standard.

INSTRUMENTS, Portable Testing. See Instruments, Portable and Switchboard: also Instruments, Pocket.

INSTRUMENTS, Laboratory Standard

Beck Bros., 3640 N. Second, Philadelphia, Pa.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Burt, R. C., 367 Michigan Ave., Pasadena, Cal. (Oscilloscopes.)
Cambridge Instrument Co., Grand Central Terminal Bldg., New York, N. Y.
Chicago Apparatus Co., 1735 N. Ashland Ave., Chicago, Ill.
Eppley Laboratory, Newport, R. I. (Standard Cells.)
Fahy. See Rubicon Co.
General Electric Co., Schenectady, N. Y.
Gray Instrument Co., 64½ W. Johnsen, Philadelphia, Pa.
Hickok Elec'l Instrument Co., 10514 Dupont, Cleveland, O.
Jagabi. See Biddle, James G.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kasson. See Rawson Elec'l. Instrument Co.
Kelvin. See Leeds & Northrup Co.
Kohlrausch. See Leeds & Northrup Co.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Milvay. See Chicago Apparatus Co.
Osiso. See Westinghouse Electric & Mfg. Co.
Radio Elec'l Wks., 50 W. 22nd, New York, N. Y.
Rawson Elec'l Instrument Co., Cambridge, Mass.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Rubicon Co., 29 N. Sixth, Philadelphia, Pa. (Wheatstone Bridges, Galvanometers, Inductance Condensers, Potentiometers, Resistance Boxes, Permeameters.)
Simplex. See Leeds & Northrup Co.
Strobatchy. See Radio Elec'l Wks.
Stromberg Electric Co., 223 W. Erie, Chicago, Ill.
Thompson-Levering Co., 351 N. 57th St., Philadelphia, Pa.
Unigwon. See Rawson Elec'l Inst. Co.
Vreeland Apparatus Co., 140 Cedar, New York, N. Y. (Sine Wave Oscillators.)
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.

INSTRUMENTS, Pocket

Advance. See Eldredge Elec'l Corp.
Adbro Mfg. Co., 927 French, Pittsburgh, Pa.
Eclipse. See Eldredge Elec'l Corp.
Eldredge Elec'l Corp., 3 P. O. Sq., Springfield, Mass.
Ideal Instrument Co., Penacook, N. H.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Lundquist Tool & Mfg. Co., Worcester, Mass.
Milawelt. See Adbro Mfg. Co.
Readrite Meter Works, 7 College Ave., Bluffton, Ohio.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Shire Elec. Products Co., Marquette Bldg., Detroit, Mich.
Sholder-Excel Mfg. Co., Clyde, Ohio.

Square D Company, Detroit, Mich.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.
Wigginton. See Square D Company.
Yankee. See Lundquist Tool Mfg. Co.

INSTRUMENTS, Portable and Switchboard

This heading includes all standard, portable and switchboard types, measuring and testing instruments—ammeters, voltmeters, wattmeters, ohmmeters, cable testers and fault-finders.

See Also Instruments, Pocket; Also Instruments, Laboratory Standard.

Beck Bros., 421 Sedgley Ave., Philadelphia, Pa.
Beede Instrument Co., Penacook, N. H.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne and Windrim Sts., Philadelphia, Pa.
Cambridge Instrument Co., Grand Central Terminal, New York, N. Y.
Dongan Electric Mfg. Co., 2985 Franklin, Detroit, Mich.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Electric Mfg. Co., 966 Mission, San Francisco, Cal.
Esterline-Angus Co., Speedway, Indianapolis, Ind.
Fidelity Electric Co., Lancaster, Pa.
Fisher Cable Test Sets. See Leeds & Northrup.
Fore Elecl. Mfg. Co., 5255 Wabada Ave., St. Louis, Mo.
Freyn Engrg. Co., 310 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
General Radio Co., Cambridge, Mass.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa.
Ground-Ohmer. See Sticht & Co.
Hamilton-Sangamo Corp., Springfield, Ill.
Handy. See Weinberg & Co.
Hickok Elecl. Inst. Co., 10514 Dupont, Cleveland, O.
Hoyt Elecl. Inst. Wks., 857 Boylston, Boston, Mass.
I T L. See Illinois Testing Laboratories.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Master. See Jewell Elecl. Instrument Co.
M. D. C. See Metropolitan Devices Corp.
Megger Testing Sets. See Biddle.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn
Multi-Volt Trouble Finder. See Welford, Jr., Geo. W.
Nagel Elecl. Co., W. G., 23 St. Clair, Toledo, Ohio.
Norton Elecl. Inst. Co., 81 Hilliard, Manchester, Conn.
Paneltest Meters. See Beede Instrument Co.
Peerless Meters. See Thompson-Levering Co.
Pier Equipment Mfg. Co., Benton Harbor, Mich.
Pin-Jack. See Weston Elec'l Instrument Co.
Price Hollister Co., Rockford, Ill.
Queen. See Gray Instrument Co.
Radio Electric Works, 150 West 22nd St., New York, N. Y.
Rawson Elecl. Inst. Co., Cambridge, Mass.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Shortfinder. See Eisemann Shortfinder Co.
Standee. See Sticht Co., H. H.
States Co., Hartford, Conn.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Tanner Engrg. Co., Rawson St. and Nelson Ave., Long Island City, N. Y.
Test-A-Bat. See Beede Instrument Co.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thomson. See General Electric Co.
Triplex Meters. See Roller-Smith Co.
3 in 1. See Sticht & Co., H. H.
Two in One. See Stitchet Co., Herman H.
United States Gauge Co., 44 Beaver, New York, N. Y.
Utility. See Esterline-Angus Co.
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.

INSULATION (Insulating) (Insulators)

Beads. See Beads, Insulating.
Canopy. See Insulators, Canopy.
Cloth. See Cloth & Paper.
Composition. See Molded Insulation.
Compound. See Wax and Comp.
Fibre. See Fibre.
Lava. See Cores, Resistance Coil.
Marble. See Slate.
Mica. See Mica.
Molded. See Molded Insulation.
Paint. See Paint, Varnish, Laquer.
Paper. See Cloth and Paper Insulating.
Phenolic. See Fibre, Phenol. Also Molded Insulation.
Porcelain. See Porcelain.
Rod. See Rubber, Hard.
Rubber. See Rubber, Hard.
Sealing Wax. See Wax and Compounds.
Slate. See Slate.
Soapstone. See Soapstone.
Tubing. See Tubing, Varnished Fabrics.
Varnish. See Paint and Varnish.
Wax. See Wax and Compounds.

INSULATING MACHINES, WIRE. See Wire Manufacturing Machines.

INSULATING TUBING. See Tubing, Varnished Fabric; also Tubing, Rubber.

INSULATION CUTTERS

Artos Engrg. Co., 115 Brown, Milwaukee, Wis.

INSULATION MIXERS

Baker Perkins Co., Saginaw, Mich.

INSULATION SHEARS. See Shears, Insulation.

INSULATION STRAINING MACHINES. See Wire Manufacturing Machines.

INSULATION TESTERS. See Instruments, Laboratory Standard.

INSULATORS, Canopy

Continental-Diamond Fibre Co., Bridgeport, Pa.
Franklin Fibre Specialty Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Knu. See Stanley, Arthur F.
Macallen Co., Boston 27, Mass.
Stanley, Arthur F., 150 Varick, New York, N. Y.
Wilmington Fibre Specialty Co., Wilmington, Del.

IRON CASTINGS. See Castings, Gray Iron.

IRONS, Soldering. See Soldering Irons.

JACKS, Armature. See Lifts, Armature.

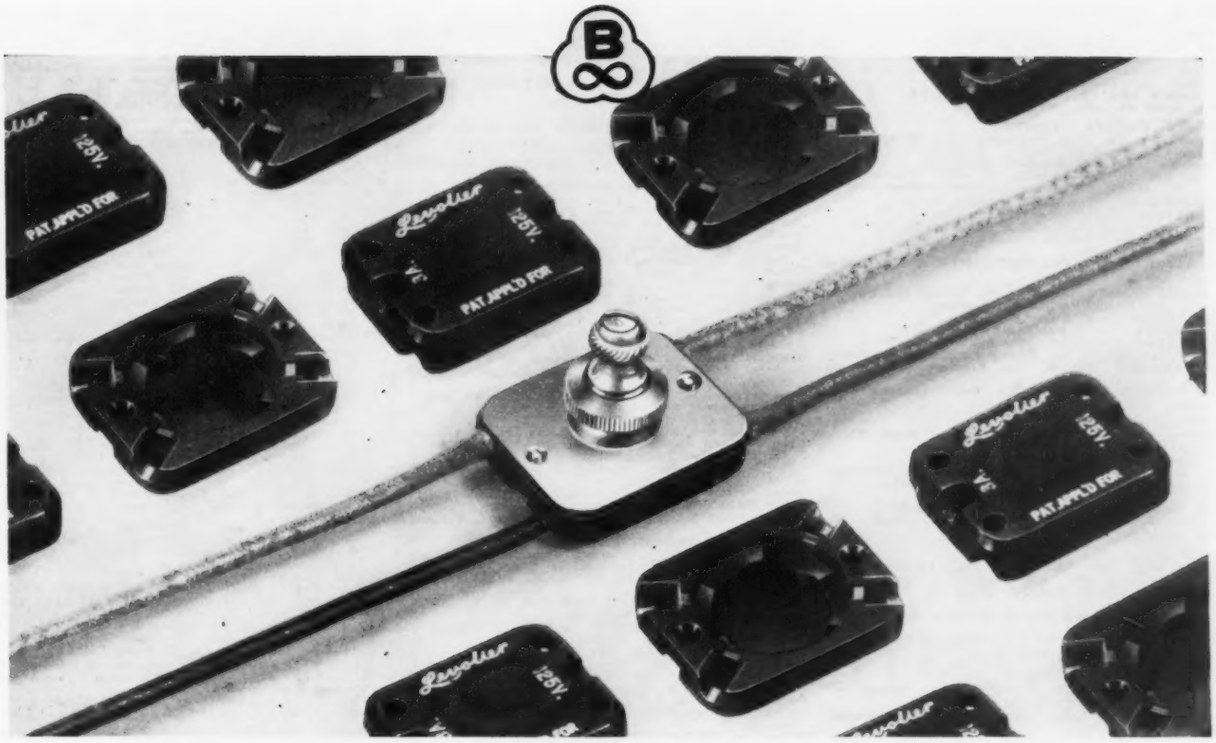
JACKS, Radio. See Radio Receiver Parts.

JARS, Battery, Glass

For Composition Jars. See Molded Insulation; also Rubber.
Corning Glass Co., Corning, N. Y.
Cumberland Glass Mfg. Co., Bridgeton, N. J.
Gaynor Glass Works, Salem, N. J.
Gillinder & Sons, Inc., Philadelphia, Pa.
Hazel-Atlas Glass Co., Wheeling, W. Va.
Macbeth-Evans Glass Co., Dept. G, Eastern Division, Charlerol, Pa.
Rodefer Glass Co., Bellaire, O.
Sneath Glass Co., Hartford City, Ind.
United States Glass Co., 9th & Bingham, Pittsburgh, Pa.

JEWELS, Instrument Bearing

Bird, Richard H., Waltham, Mass.
Deknatel & Sons, J. A., Queens Village, N. Y.
Eastern Specialty Co., 3651 N. Fifth, Philadelphia, Pa.
Fisher, Thomas E., Penacook N. H.



McGill canopy switch, and a number of the Bakelite Molded parts, McGill Mfg. Co., Valparaiso, Ind.

"We went direct to *Bakelite Molded* for strength and accuracy"

The little canopy switch on lighting fixtures, floor and table lamps, must be compact, strong and durable. The block of insulation material, within which the switch is assembled, must be accurate in form and dimension, possess excellent dielectric properties, and not be subject to deterioration through age or exposure.

Because Bakelite Molded possesses every necessary requisite for the insulation block of a canopy switch, it has been adopted for the McGill switch, and for most others of this type. Bakelite Molded combines physical and dielectric strength and is non-hygroscopic. Parts made of this material come from the mold finished and no subsequent machining nor polishing are necessary. Trade-names and other markings are permanently formed in the molding operation.

Small Bakelite Molded parts are most economically produced in a multiple cavity mold, sometimes a hundred or more at each closing of the press. In the case of the McGill switch a sixteen cavity mold was used. Manufacturers of electrical devices and appliances will be interested in reading Booklet 52M, "Bakelite Molded," a copy of which will be mailed upon request.

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JEWELS, Instrument Bearing—Continued
Gatti, Inc., Aurele M., Liberty St. & Fairmount Ave., Trenton, N. J.
Moser Jewel Co., Perth Amboy, N. J.
Mildrum Jewel Co., East Berlin, Conn.
Sapphire Products Co., 51 Chambers, New York, N. Y
Universal. See Oefinger, J. L.
Wennstrom's Sons Co., John, Suffern, N. Y.
Worley Jewel Co., John, Waltham, Mass.

JOINTS, Fixture Insulating

Appleton Elec. Co., 1703 Wellington Ave., Chicago, Ill.
Macallen Co., Boston 27, Mass.
Sandow Tool Co., 1440 Broadway, New York, N. Y.
Sprecher Mfg. Co., P. W., 3220 North Ave., Milwaukee.
White Co., O. C., 15 Hermon, Worcester, Mass.
Wittenberg Bros., 60 Shipman, Newark, N. J.

LABORATORY (Laboratories.)
Ovens. See Ovens, Industrial & Laboratory.
Rheostats. See Rheostats.
Testing. See Testing.

LABORATORY STANDARD INSTRUMENTS. See Instruments, Laboratory Standard.

LACQUER, ARMATURE. See Paint, Varnish and Lacquer Metal. See Paint, Varnish and Lacquer.

LAMINATIONS. See Discs, Armature.

LAMP BASES. See Bases, Reading Lamp.

LAMP BULBS (Unfinished). See Bulbs, Glass.

LAMP FILAMENTS. See Filaments, Incandescent Lamp.

LAMP LEAD-IN WELDS. See Filaments, Incandescent Lamp.

LAMP TESTING PHOTOMETERS. See Photometers, Lamp Testing.

LATHES

(Special for use in Motor Repairing and Motor Mfg.—Test Bench Lathes).
Ajax Electric Co., Kalamazoo, Michigan.
Allen Electric & Equipment Co., Kalamazoo, Michigan
Cincinnati Lathe & Tool Co., 3207 Disney (Oakley) Cincinnati, Ohio.
Hobart Bros. Company, Troy, Ohio. (Test Bench).
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill.

LAVA. See Cores, Resistance Coil.

LEAD

American Lead Co., 3112 Penn Ave., Pittsburgh, Pa.
Blatchford Co., E. W., 608 Dearborn, Chicago, Ill.
Columbia Smelting & Refining Wks., 365 West, New York, N. Y.
DuBois & Co., Frederick N., 152 Riverside Ave., Newark, N. J.
Eagle-Picher Lead Co., 134 N. LaSalle, Chicago, Ill.
Federated Metals Corp., Woolworth Bldg., New York, N. Y.
Jacobson & Son Co., I. M., 15304 Idaho, Detroit, Mich.
National Lead Co., 111 Broadway, New York, N. Y.
Raymond Lead Co., 735 S. Washtenam Ave., Chicago, Ill.
Turner Lead Co., East St. Louis, Ill.

LEAD-IN WELDS, Lamp. See Filaments, Incandescent Lamps.

LEADS, FLEXIBLE (Commutator Brush). See Brushes, Commutator.

LENSES

Sign Letter, Flashlight, Projector and Reflector Lenses Also glass caps, jewels and bezels for all electrical devices See also Jewels, Instrument Bearing.
Bausch & Lomb Optical Co., 635 St. Paul, Rochester, N. Y. (Condensing and Projection Lenses.)
B. B. T. Corp. of America, Atlantic Bldg., Philadelphia, Pa.
Corning Glass Wks, Corning, N. Y. (Flashlight and Signal.)
Deknatel & Sons, J. A., Queens Village, N. Y.
Goerz American Optical Co., C. P., 317 E. 34th, New York.
Jefferson Glass Co., Follansbee, W. Va. (Sign and Flashlight.)
Kliegl Bros. Universal Stage Ltg. Co., 321 W. 50th, New York, N. Y. (Condensing and Projector.)
Macbeth Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa. (Flashlight.)
North Light Corp., 30 W. 15th, New York, N. Y.
Popper & Sons, Leo, 147 Franklin, New York, N. Y.
Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill.
Rochester Glass Products Co., 29 N. Water, Rochester, N. Y.
Rodefer Glass Co., Bellaire, O. (Flashlight.)
Sneath Glass Co., Hartford City, Ind. (Sign.)
Stromberg-Carlson Telephone Mfg. Co., 1050 University Ave., Rochester, N. Y.

LETTERS, Sign

Glass. Metal.
Adsign Corp, 113 W. 63rd, New York, N. Y.
Chain Products Co., 3924 Cooper Ave., Cleveland, O. (Brass and White Metal.)
Chicago Miniature Lamp Co., 654 W. Lake, Chicago, Ill. (Raised Letters for Signs.)
Eradium. See Pioneer Corporation.
Federal Elec. Co., 3700 S. State, Chicago, Ill. (Metal.)
Grammes & Sons, Inc., L. F., Allentown, Pa.
Heralite. See Pressed Prism Plate Glass Co.
Kolux Glass Sales Co., Kokomo, Ind.
Lu-Mi-Nus Signs, Inc., 2736 Wentworth Ave., Chicago, Ill
Manhattan Elecl. Supply Co., 510 Sixth Ave., New York, N. Y. (For Gas Signs.)
Opalite Corp., 201 E. Ohio, Chicago, Ill.
Pioneer Corporation, 8308 Yale Ave., Chicago. (Luminous.)
Pressed Prism Plate Glass Co., Chicago, Ill. (Glass.)

LIFTS, Armature

Lifts, Hoists, Jacks, Trucks, Buggies, Floor Cranes
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff Mfg. Co., Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.

LININGS, Socket

Remington Mfg. Co., 937 Barnum Ave., Bridgeport, Conn

LOCK WASHERS. See Washers, Lock.

LOOP WINDERS & SPREADERS. See Winding Machines, Armature & Field Coil.

LOUD SPEAKER DIAPHRAGMS MATERIAL. See Cloth, Untreated; also Parchment Paper.

LOUD SPEAKERS

Manufacturers Units and Electric Pick-ups for Portable and Built-in Types.
Amervox. See American Reproducer Co.
American Reproducers Co., 1204 Summit Ave., Jersey City, N. J.
A. R. C. See American Reproducers Co.
Amplion. See Woolf, J. W. & W. L.
Balsa Wood Co., 158 Pioneer, Brooklyn, N. Y.
Baritone Mfg. Co., 846 Jackson Blvd., Chicago, Ill.
Brielle. See Penn Mfg. Co.
Brooklyn Metal Stamping Corp., 720 Atlantic Ave., Brooklyn, N. Y. (Electric Pick-up.)
Cannonball. See Cannon & Miller Co.
Cannon & Miller Co., Springwater, N. Y.
Chelten Electric Co., 4859 Stenton Ave., Philadelphia, Pa
Conamic. See Operadio Mfg. Co.
Decatur Mfg. Co., 45 Harman St., Brooklyn, N. Y.
Dreher & Son, Chas., 157 Spring, New York, N. Y.
Dymac. See Electrical Products Mfg. Co.
Electrical Products Mfg. Co., Providence, R. I.
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill. (Units.)
Empire United Hat Block Co., 312 E. 12nd, New York.
Engineers Service Co., 25 Church, New York, N. Y. (Kit.)
Ensco. See Engineers Service Co.
Fenco Cone Co., 57 Murray, New York, N. Y. (Kit.)
Fidelity Radio Corp., Salt Lake City, Utah.
F. & H. Radio Laboratories, Fargo, N. D.
Globe Technolian Corp., Reading, Mass.
G. R. P. See Penn Mfg. Co.
Grutal Speaker Co., 609 E. Walnut, Des Moines, Iowa.
Jensen Radio Mfg. Co., 6601 S. Lavanie Ave., Chicago, Ill.
Kersten Radio Equipment, Inc., 1415 Fillford, Kalamazoo Mich.
Kyle. See Newcombe-Hawley.
Lata Balsa. See Balsa Wood Co.
Magnavox Co., 4250 Horton, Oakland, Cal. Also Units.
Markone Radio Mfg. Co., 303 Devoe, Brooklyn, N. Y. (Horn only.)
Miles Mfg. Corp., 33 W. 21, New York, N. Y.
Minuet. See Thompson Radio Co.
Molded Wood Products. 219 W. Chicago Ave., Chicago, Ill.
Newton Elec'l Mfg. Co., Newton, Mass.
O'Neil Mfg. Corp., West New York, N. J.
Operadio Mfg. Co., St. Charles, Ill.
Oxford Radio Corp., 3200 Carroll Ave., Chicago, Ill.
Peerless. See United Reproducers Corp.
Penn Mfg. Co., G. R., 231 Mercer, New York, N. Y.
Philadelphia Storage Battery Co., Ontario & C Sts., Philadelphia, Pa.
Philco. See Philadelphia Storage Battery Co.
Platter Cabinet Co., North Vernon, Ind.
Powerola. See Temple Corp.
Puronower. See Platter Cabinet Co.
Quam Radio Corp., 9705 Cottage Grove Ave., Chicago, Ill.
Racon Elec. Co., 18 Washington Place, New York, N. Y. (Horn only.)
Red Lion Cabinet Co., Red Lion, Pa.
Stromberg-Carlson Tel. Mfg. Co., 1060 University Ave., Rochester, N. Y.
Swoboda Co., Maritime Bldg., Seattle, Wash.
Temple Corp., 5253 W. 65th, Chicago, Ill.
Thompson Radio Co., 25 Church, New York, N. Y.
Titratone Mfg. Co., 1046 W. Van Buren, Chicago, Ill.
United Reproducers Corp., 25 Leighton Ave., Rochester, N. Y.
Universal. High Power Telephone Co., Carleton Ave. and Eddy, Seattle, Wash.
Utah Radio Products Co., 1615 S. Michigan Ave., Chicago, Ill. (Also Piano Unit.)
Victor Radio Corp., 4321 N. Western Ave., Chicago, Ill.
Wondrphone. See Universal High-Power Telephone Co
Woolf, J. W. & W. L., 133 W. 21st, New York, N. Y.
Wright-De Coster, Inc., St. Paul, Minn.
Zisch Engineering Corp., Newark, N. J.

LUGS, Copper

Anderson Mfg. Co., Albert & J. M., 289 A St., Boston, Mass.
Dante Elecl. Mfg. Co., Bantam, Conn.
French Mfg. Co., Waterbury, Conn.
General Electric Co., Schenectady, N. Y.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Wolverine Tube Co., 1433 Central Ave., Detroit, Mich

LUMINOUS SPECIALTIES

	KEY
Luminous Compound	See C
Pendants (Bulbs)	See P
Standard Parts	See S

Acornlite Studios, 675 72nd, Brooklyn, N. Y. . . P
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. . . S P
Bryant Electric Co., Bridgeport, Conn. . . P
Connecticut Elec. Mfg. Co., Bridgeport, Conn. . . S
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis.
Eagelite. See Eagle Elec. Mfg. Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y. . . P
General Elec. Co., Merchandise Dept., Bridgeport, Conn. . . S P
Glow Lite. See Rodale Mfg. Co.
Glow Tip. See Arrow Electric Co.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Electric Co., Hartford, Conn. . . S P
Hubbell, Inc., Harvey, Bridgeport, Conn. . . P
Luma & Luma Lite. See Radium Dial Co.

Radieye. See General Electric Co.
Radium Dial Co., 3532 Forbes, Pittsburgh, Pa. . . . C . . P
Reynolds Spring Co., Jackson, Mich. . . . S . .
Rodale Mfg. Co., 200 Hudson, New York, N. Y. . . . P
Seelite. See T. C. Smith & Co.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia . . P
Spot O Life. See Hart & Hegeman Mfg. Co.
Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y. . . . C S P

MACHINE SCREWS. See Screws, Machine.

MACHINE SCREW PRODUCTS. See Screw Machine Products.

MACHINES

Armature Banding. See Banding Machines, Armature
Armature Notching. See Notching Machines, Armature
Balancing. See Balancers, Armature.
Banding. See Banding Machines, Armature.
Cable Armoring. See Wire Manufacturing Machines.
Coil Shaping. See Shaping Machines, Coil.
Coil Taping. See Taping Machines, Coil.
Coil Winding. See Winding Machines.
Commutator Slotting. See Mica Undercutters.
Engraving. See Engraving Machines.
Incandescent Lamp Making. See Machines, Lamp Making
Molded Insulation. See Presses, Molded Insulation.
Perforating. See Perforating Machines.
Porcelain Molding. See Presses, Porcelain Molding
Radio Tube. See Machines, Lamp Making.
Shaping. See Shaping Machines, Coil.
Slotting. See Mica Undercutters.
Soldering. See Soldering Machines, Commutater.
Spring Making. See Spring Making Machines.
Taping. See Taping Machines, Coil.
Tension. See Tension Machines, Band Wire.
Winding. See Winding Machines.
Wire, Armoring. See Wire Manufacturing Machines.
Wire Drawing. See Wire Drawing Machinery.
Wire Insulator. See Wire Manufacturing Machines.
Wire Measuring. See Wire Manufacturing Machines.
Wire Tension. See Tension Machines, Band Wire.
Wire Wrapping. See Wire Wrapping Machines.

MACHINES, Lamp Making

For Making Incandescent Lamps and Vacuum Tubes.
Berrenberg, R., 13 Farnham (Roxbury), Boston, Mass (Vacuum Pumps.)
Dwyer Machine Co., Lynn, Mass.
Eisler Electric Corp., 270 S. 13th, Newark, N. J.
General Engineering & Supply Co., 160 5th Ave., New York N. Y. Filament Winder.
Gesco. See General Engineering & Supply Co.
Sleeper & Hartley, Inc., Worcester, Mass.
York Elec. & Machine Co., 30 Penn, York, Pa.

MACHINES, Spring Making. See Spring Making Machines

MACHINES, WIRE MANUFACTURING. See Wire Manufacturing Machines.

MAGNET CHARGERS. See Chargers, Magnet.

MAGNET STEEL. See Steel, Magnet.

MAGNET TESTERS. See Instruments, Portable and Switchboard; also Instruments, Pocket.

MAGNET WIRE MACHINES. See Enameling Machines for Magnet Wire.

MAGNETIC CHUCKS. See Chucks, Magnetic.

MAGNETIC CLUTCHES. See Clutches, Magnetic.

MAGNETOMETERS. See Instruments, Pocket.

MAGNETS, Permanent

Bulleus Co., D. K., Pottstown, Pa.
Ind. Steel Products Co., 4545 S. Western Blvd., Chica.
Rogers Drop Forging Co., Worcester, Mass.
Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
Sticht & Co., H. H., 13 Park Row, New
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.

MALLETS, Raw Hide

Chicago Rawhide Mfg. Co., 1313 Elston Ave., Chicago, Ill.
Crude Pelt. See Chicago Rawhide Mfg. Co.
Holbrook Raw Hide Mfg. Co., 748 N. Main, Providence, R. I.

MANGANESE, Battery. See Chemicals, Battery.

MEASURING INSTRUMENTS. See Instruments.

METAL CUTTING OUTFITS. See Welding and Cutting

MECHANICAL RUBBER GOODS. See Rubber Mechanical Goods.

MEGOHMMETERS. See Instruments, Laboratory Standard

MERCURY SWITCHES. See Switches, Mercury.

METAL CLEANERS (Compound). See Cleaners, Metal.

Outfits.

METAL FINISHING. See Plating & Finishing.

METAL MARKING OUTFITS. See Engraving Machines

METALLIC SHADES. See Shades, Metallic.

METERS. See Instruments.

MICA SHADES. See Shades, Mica.

MICA TAPE. See Tape, Mica.

MICA UNDERCUTTERS. See Slotting Machines & Tools, Commutator.

MICA

Asheville Mica Co., Biltmore, N. C.
Asco. See Schoonmaker Insulation Co.
Brand & Co., William, 268 Fourth Ave., New York, N. Y.
Chicago Mica Co., 345 Campbell, Valparaiso, Ind.
Colonial Mica Co., 136 Seventh, Jersey City, N. J.
Fillion, S. O., 68 Murray, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Gerdau Co., Otto, 533 Canal, New York, N. Y.
Hirsch Mica Co. 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
International Mica Co., 3660 Brandywine, Philadelphia, Pa
Kant Krack. See Huse Liberty Mica Co.
Keene Mica Co., Keene, N. H.
Macallen Co., Boston 27, Mass.
Micabond. See Chicago Mica Co.

Checking Motor Drives With Instruments

—By Braymer

Another of a series of informative articles
on the use of electrical instruments.

Page 41.

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QUALITY is not a matter of chance in Textolite molded. It begins in strict uniformity of the plastic—uniformity that results from compounding the best of raw materials under the guidance of skilled technicians from the General Electric laboratories.

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Miralite. See Mitchell-Rand Mfg. Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 135 Johnson, Brooklyn, N. Y.
Micanite. See Mica Insulator Co.
Mica Products Mfg. Co., 54 Greene, New York, N. Y.
Munsell & Co., Eugene, 200 Varick, New York, N. Y.
Nemeo. See New England Mica Co.
New England Mica Co., Waltham, Mass.
New England Minerals, Inc., 85 Devonshire, Boston, Mass.
New York Mica & Mfg. Co., Auburn, N. Y.
Peerless. See New England Mica Co.
Prestonite. See Robt. K. Preston Mica Co.
Preston Mica Co., Robt. K., 957 Monadnock Blk., Chicago. (Ground Mica.)
Red Streak. See Huse Liberty Mica Co.
Rogers-Pratt Shellac Co., 81 Water St., New York. (Imp.)
Schoonmaker Insulation Co., A. O., 34 University Place, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Watson Bros., 170 Purchase, Boston, Mass.

MINIATURE SWITCHBOARD SYSTEMS. See Instruments, Portable and Switchboard.

MIXERS, INSULATION. See Insulation Mixers.

MOLDED
Presses. See Presses, Molded Insulation.
Radio Parts. See Radio Molded Parts.
Shades. See Molded Insulation.

MOLDED INSULATION

Aleo. See American Insulator Corp.
Allen & Hills, Inc., Auburn, N. Y.
American Insulator Corp., New Freedom, Pa.
American Machine & Foundry Co., 5520 Second Ave., Brooklyn, N. Y.
Amerine. See American Insulator Corp.
Anderson Mfg. Co., Albert & J. M., 289 A. Boston, Mass.
Asbestos Shingle Slate & Sheathing Co., Ambler, Pa. (Cold.)
Auburn Button Wks., 48 Canoga, Auburn, N. Y.
Bakelite Corp., 247 Park Ave., New York, N. Y.
Bay State Moulding Co., 1197 Dorchester Ave., Boston.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Beldenmold. See Belden Mfg. Co.
Bell Mfg. Co., 11 Elkins, Boston, Mass. Radio Parts.
Boonton Molding Co., Boonton, N. J.
Boonton Rubber Mfg. Co., 223 Fanny Rd., Boonton, N. J.
Brelite Moulding Corp., 100 Hudson, Jersey City, N. J. (Wood Composition.)
Celluloid Corp., 10 E. 40th, New York, N. Y.
Celoron Co. Div. of Continental-Diamond Fibre Co., Bridgeport, Pa.
Cetelite. See Connecticut Molded Products Corp.
Cetec. See Connecticut Molded Products Corp.
Cepco. See Connecticut Molded Products Corp.
Coltrock. See Colt's Patent Firearms Mfg. Co.
Charmond Elec. Corp., 30 Church, New York, N. Y.
Chicago Molded Products Co., 2140 Walnut, Chicago, Ill.
Cincinnati Molding Co., 2037 Florence Ave., Cincinnati, O.
Colasta Co., Hoosick Falls, N. Y.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Compo-Site, Inc., 207 Astor, Newark, N. J.
Condensite. See Bakelite Corp.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Connecticut Molded Products Corp., Meriden, Conn. (Cold.)
Cutler-Hammer, Inc., 1283 St. Paul Ave., Milwaukee.
Dayton Insulating Moulding Co., 434 E. First, Dayton, Ohio.
Diemoulding Production Co., Canastota, N. Y.
Dimec. See Dayton Insulating Moulding Co.
Durez. See General Plastics, Inc.
Electrose. See Insulation Mfg. Co.
Erinoid Co., Park Row Bldg., New York, N. Y.
Evercool. See Bakelite Corp.
Formica Insulation Co., 4626 Spring Grove Ave., Cincinnati.
Garfield Mfg. Co., Garfield, N. J. Composition. (Cold.)
General Electric Co., Schenectady, N. Y.
General Moulded Composition Co., 213 Market, Lynn, Mass.
General Plastics, Inc., 76 Waick Rd., N. Tonawanda, N. Y.
Gummor. See Garfield Mfg. Co.
Hahn Mfg. Co., Harry W., 623 S. San Pedro, Los Angeles, Cal.
Herculite. See Colosta Co.
Hi-Heet. See Insulation Mfg. Co.
Imperial Molded Products Co., 2925 W. Harrison, Chicago
Improco. See Insulation Products Co.
Inda. See American Machine & Foundry Co.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Insulation Products Co., Richland, Pittsburgh, Pa.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
International Insulating Corp., Tyrta, O.
Karolith Corp., 189 13th, Long Island City, N. Y. (Casein plastics.)
Kellite. See Kellogg Switchboard & Supply Co.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Klagges, Chas., 128 147th, Ozone Park, N. Y.
Kuhn & Jacob Machine & Tool Co., 502 Prospect Ave., Trenton, N. J.
Kurz-Kasch Co., Dayton, O.

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Lacanite. See Scranton Button Co.
Lumarith. See Celluloid Corp.
Macallen Co., Boston, 27, Mass.
Mack Molding Co., Little Falls, N. J.
Makalot. See Johnson Molding & Tool Co.
Manchester Mfg. Co., Manchester Depot, Vt.
Megohom. See Waterbury Button Co.
Micarta Fabricators, Inc., 309 Canal, New York, N. Y.
Micarta. See Westinghouse Elec. & Mfg. Co.
Mico. See Molded Insulation Co.
Modern Molded Products Co., Blount and Elm Sts., Providence, R. I.
Molded Insulation Co., Mt. Vernon, N. Y.
New England Products Co., 232 Greenwich, New York, N. Y.
Niagara Insul-Bake Specialty Co., 483 Delaware Ave., Albany, N. Y.
Nixon Nitration Works, Nixon, N. J.
Nixonoid. See Nixon Nitration Works.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Norlac. See Norton Laboratories, Inc.
Northern Industrial Chemical Co., 11 Elkin, South Boston
Norton Laboratories, Inc., 1025 Mill, Lockport, N. Y.
Panelyte Corp., Trenton, N. J.
Paramix. See Splitdorf Radio Corp.
Paratherm. See Scranton Button Co.
Phenolic. See Scranton Button Co.
Plastic Molding Corp., Sandy Hook, Conn. (Cold.)
Pruven Composition Products Corp., Milford, Conn.
Pruvenite. See Pruven Composition Products Co.
Pyrolax. See Cutler-Hammer Mfg. Co.
Recto Mfg. Co., 23 W. 3rd, Cincinnati, O.
Redmonol. See Bakelite Corp.
Rexlite. See Northern Industrial Chemical Co.
Reynolds Spring Co., Jackson, Mich.
Reynolite. See Reynolds Spring Co.
Reynomold. See Reynolds Spring Co.
Richardson Co., Lockland, Cincinnati, O.
Ridgelite. See Ridgley Trimmer Co.
Ridgley Trimmer Co., Springfield, O.
Schneider Bros., Inc., 312 N. Sheldon Ave., Chicago.
Scranton Button Co., Scranton, Pa.
Shaw Insulator Co., Irvington, Newark, N. J.
Siemon Co., State and Dewey, Bridgeport, Conn.
Specialty Insulation Mfg. Co., Hoosick Falls, N. Y.
Star Insulate. See Insulation Mfg. Co.
Starite. See Insulation Mfg. Co.
Stokes & Smith Co., Summerdale Ave. near Roosevelt Blvd., Philadelphia, Pa.
Textolite. See General Elec. Co.
Thermoplax. See Cutler-Hammer Mfg. Co.
Tezit. See Garfield Mfg. Co.
Union Insulating Co., Parkersburg, W. Va.
Vulcabeston. See Colt's Patent Fire Arms Mfg. Co.
Vulcanized Rubber Co., 251 Fourth Ave., New York, N. Y.
Waterbury Button Co., Waterbury, Conn.
Watertown Mfg. Co., Watertown, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

MOLYBDENUM

Elkon, Inc. (Div. of P. R. Mallory Co.), 350 Madison Ave., New York, N. Y.
Lohfeld & Co., J. L., 53 Park Place., New York, N. Y.
Palatine Industrial Co., 111 Fifth Ave., New York, N. Y.
Radiotherma, Inc., 45 E. 17th, New York, N. Y.
Sirian Wire Co., 255 Sherman Ave., Newark, N. J.

MONEL METAL

International Nickel Co., 67 Wall, New York, N. Y.

MOTOR CONTROLLERS. See Controllers, Motor.

MOTOR PLATFORM BASES. See Bases, Motor Platform

MOTOR STARTERS. See Controllers, Motor; Switches, Remote Control; Switches, Motor Starting; Safety; Switches Snap (Heavy Duty).

MOTORS

Alternating Current	See S
Direct Current	See S
Motors, 1 Hp. up	See M
Motors Fractional Hp.	See F
Universal	See U

Actodector. See Century Electric Co.
Advance Elec. Co., 4311 Maple Ave., St. Louis M F S ..
Allis-Chalmers Mfg. Co., Milwaukee, Wis..... M .. S ..
Allis Co., Louis, Milwaukee, Wis..... M .. S ..
American Elec. Motor Co., Cedarburg, Wis..... M .. .. ..
Apex Elec'l Mfg. Co., 1067 E. 152nd, Cleveland .. F S U
Armor Elec. Mfg. Co., 1020 Holland, Erie, Pa. M .. .. ..
Baldor Elec. Co., 4352 Duncan Ave., St. Louis M F S ..
B-Line. See Brown-Breckmeyer Co.
Bodine Elec. Co., 2254 Ohio, Chicago..... .. F S U
Bogue Elec. Co., Chas. J., 132 King, New York M .. .. ..
Brown-Brockmeyer Co., Norwood Power Bldg., Dayton, O..... M F .. ..
Burke Elec. Co., Erie, Pa..... M F S U
B. T. See Allis Co., Louis.
B & R Mfg. Co., 813 Lafayette, Toledo, O..... .. F .. ..
Century Elec. Co., 1806 Pine, St. Louis, Mo.. M F S ..
Chandeysson Elec. Co., St. Louis, Mo..... M .. S ..
Clark, Jr., Elec. Co., James, 600 E. Bergman, Louisville, Ky. ..... M .. .. ..
Cleveland Armature Wks., 4732 St. Clair Ave., Cleveland, O. ..... M .. S ..
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind.
Continental Elec. Co., 14 Magazine, Newark... M .. S ..
Crocker-Wheeler Elec. Mfg. Co., Ampere, N. J. M .. S U
Cushman Elec. Co., Concord N. H..... M F S ..
Day-Fan Electric Co., Dept. A, Dayton, O.... .. F S ..
Diehl Mfg. Co., Elizabeth, N. J..... M F S ..
Diverter Pole. See Rochester Elec. Product Co.
Domestic Electric Co., 7209 St. Clair Ave., Cleveland, O. ..... S F ..
Dumore Co., 35 16th, Racine, Wis..... .. F .. U
Eclipse. See Fidelity Elec. Co.
Electric Machinery Co., Minneapolis, Minn.. M .. S ..
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O. ....

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Emerson Electric Mfg. Co., 2018 Washington Ave., St. Louis, Mo..... M F S U
Engberg's Elec. & Mechl. Works, St. Joseph, Mich. ..... M .. S ..
Esco. See Electric Specialty Co.
Fairbanks-Morse & Co., 900 S. Wabash Ave., Chicago, Ill. ..... M F .. ..
Fidelity Elec. Co., Lancaster, Pa..... M F S U
Fitzgerald Mfg. Co., Torrington, Conn..... .. F .. ..
Fynn Welchsel. See Wagner Elec. Corp.
Galvin Elec. Mfg. Co., 3314 S. Broadway, St. Louis, Mo. ..... F .. S ..
General Elec. Co., Schenectady, N. Y..... M F S U
Gilbert Co., A. C., New Haven, Conn..... .. F .. U
Hamilton Beach Mfg. Co., Racine, Wis..... .. F S U
Hobart Bros. Co., Troy, O..... M .. S ..
Holtzer-Cabot Elec. Co., 125 Amory, Boston... M F S ..
Howell Elec. Motors Co., Howell, Mich..... M .. S ..
Ideal Elec. & Mfg. Co., Mansfield, O..... M .. S ..
Imperial Electric Co., Akron, O..... M .. S ..
Janette Mfg. Co., 556 W. Monroe, Chicago..... .. F S ..
Jantz & Leist Elec. Co., Cincinnati, O..... M F .. ..
Jeannin Electric Co., Fassett & N. Y. C. R. R. Toledo, O. ..... M F S ..
Kendrick & Davis Co., Lebanon, N. H..... .. F S ..
Kimble Elec. Co., 634 N. Western Ave., Chicago M .. S U
Knapp Elec., Inc., Portchester, N. Y..... .. F S U
Leland Elec. Co., Dayton, O..... .. F S ..
L. E. See Leland Elec. Co.
Lincoln Elec. Co., Cleveland, Ohio..... M .. S ..
Line-Weld. See Lincoln Elec. Co.
Linsee Elec. Motor Co., Mansfield, O..... M .. .. ..
Mando Co., 911 State Tower Bldg., Syracuse, N. Y. (6-12-40 Volt only)..... F .. .. ..
Marathon Elec. Mfg. Co., 32 Island, Wausau, Wis. .. F .. ..
Marble-Card Elec. Co., Gladstone, Mich..... M .. .. ..
Master Electric Co., Dayton, O..... M F S ..
MC. See General Electric Co.
Michigan Elec. & Mfg. Co., Lake Linden, Mich. .. F S ..
N. C. See Electric Controller & Mfg. Co.
Norfolk. See Walter Elec. Mfg. Co.
North East Elec. Co., Rochester, N. Y..... .. F .. U
Northwestern Mfg. Co., 480 Clinton, Milwaukee M .. .. ..
Ohio Elec. & Controller Co., 5903 Maurice Ave., Cleveland, Ohio .... F S ..
O. K. See Marathon Elec. Mfg. Co.
Osann Co., F., 245 Seventh Ave., New York M .. .. ..
Peerless Elec. Co., 740 W. Market St., Warren, O. M F S U
Polar Cub. See Gilbert Co., A. C.
Pow-R-Full. See Wagner Elec. Corp.
Reco. See Reynolds Electric Co.
Red Band. See Howell Elec. Motors Co.
Reliance Elec. & Engrg. Co., 1042 Ivanhoe Rd., Cleveland, O. ..... M .. S ..
Reynolds Electric Co., 2650 W. Congress, Chicago .. F S ..
Robbins & Myers, Inc., Springfield, O..... M F S U
Standard. See Robbins & Myers Co.
Star Elec. Motor Co., Miller St. & N. J. R. R. Ave., Newark, N. J. ..... M .. S ..
Sterling Elec. Motors, Inc., Telegraph Rd. and Atlantic Blvd., Los Angeles, Cal..... M .. S ..
Stow Mfg. Co., Binghamton, N. Y..... M F S U
Sturtevant Co., 15 Devonshire (Hyde Park), Boston, Mass. ..... M F S U
Sunlight Electrical Mfg. Co., Warren, O..... .. F S ..
Super Wick. See Master Elec. Co.
Switch start. See Lincoln Elec. Co.
Union Elec. Motor Mfg. Co., Hancock & Oxford Sts., Philadelphia, Pa..... M F S ..
U. S. Elec. Mfg. Co., 200 E. Slawson Ave., Los Angeles ..... M .. S ..
Valley Elec. Co., 4221 Forest Park Blvd., St. Louis, Mo. ..... M .. S ..
Wagner Elec. Corp., 6400 Plymouth Ave., St. Louis, Mo. ..... M F S U
Walter Elec. Mfg. Co., Norfolk, Va..... M .. S ..
Watson. See Allis Co., Louis.
Welco Uniframe. See Wesche Elec. Co., B. A.
Wesche Elec. Co., B. A., 1622 Vine, Cincinnati M F S ..
Westinghouse Elec. Mfg. Co., East Pittsburgh M F S ..
Willey-Wray Elec. Co., 1522 Central Parkway, Cincinnati, O. ..... M .. S ..
Woods Mach. Co., S. A., Boston..... M F S ..
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Angell Embossing Co., 37 Barney-Smith Co., Dayton, O.
Celoron Co. Div. of Continental-Diamond Fibre Co., Bridgeport, Pa.
Chandler Co., Springfield, Mass.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Electro-Chemical Engraving Co., 52 Vanderbilt Ave., New York, N. Y.
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Premier Metal Etching Co., 14th & Van Alst Ave., Long Island City, N. J.
Waterbury Button Co., Waterbury, Conn.

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American Mond Nickel Co., Century Bldg., Pittsburgh, Pa.
Driver-Harris Co., Harrison, N. J.
International Nickel Co., 67 Wall, New York, N. Y.
National-Harris Wire Co., 195 Verona Ave., Newark, N. J.
Seymour Mfg. Co., Seymour, Conn.
United States Nickel Co., New Brunswick, N. J.

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Vim Electric Tool Co., 149 Broadway, New York, N. Y.

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OIL-LESS BEARINGS. See Bearings, Oil-less.

OSCILLOSCOPES. See Instruments, Laboratory Standard.

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Conran, Frederick M., 177 New York Ave., Newark, N. J.
Crawford Oven Co., New Haven, Conn. (Coil Driers.)
Despatch Oven Co., 622 Knight, S. E., Minneapolis, Minn.
Detroit Sheet Metal Wks., 1341 E. Milwaukee Ave., Detroit, Mich.
Devine Mfg. Co., J. P., Buffalo, N. Y.
Eberbach & Son Co., Ann Arbor, Mich. (Drying.)
Electric Heat Control Apparatus Co., 245 New Jersey R. R Ave., Newark, N. J.
Emerson Apparatus Co., Melrose, Mass. (Conditioning.)
Freas Thermo Elec. Co., 1206 Grove, Irvington, N. J.
Gehnrich Indirect Heat Oven Co., Long Island City, N. Y
General Electric Co., Schenectady, N. Y.
Hayes, C. I., 129 Baker, Providence, R. I.
Heidbrink Co., 2633 Fourth Ave., S., Minneapolis, Minn
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Kenworthy, Chas. F., 198 Piedmont, Waterbury, Conn
Maehler Co., Paul, 2210 Lake, Chicago, Ill.
Miho Co., 717 Sycamore, Cincinnati, O.
Radio Elec'l Wks., 150 W. 22nd, New York, N. Y
Sargent & Co., E. H., 155 E. Superior, Chicago, Ill.
Sioux Battery & Mfg. Co., Sioux City, Ia. (Battery.)
Snead & Co., Jersey City, N. J.
Standard Elec. Stove Co., Toledo, Ohio
Steiner & Co., H. E., 197 E. Kinney St., Newark, N. J.
Stokes Machine Co., F. J., 5926 Tabor Rd. (Olney), Philadelphia.
Swartwout Co., 18522 Euclid Ave., Cleveland, O.
Thelco, See Freas Thermo Elec. Co.
Westinghouse Elec. & Mfg. Co., Mansfield, O
Young Bros. Co., 6523 Mack Ave., Detroit, Mich.

OXIDES, Battery. See Chemicals, Battery.

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Federal Metallic Packing Co., Wakefield, Mass.
Holed-Tite Packing, Inc., 100 E. 42nd, New York, N. Y.
Packtite. See Federal Metallic Packing Co.

PAINT, Varnish, Lacquer

KEY
Varnishes, Insulating ..... See V
Painting, Dipping, Spraying, Vacuum Impregnating.
Paint, Insulating and Acid Proof..See P
Lacquer, Metal Finishing ..... See L

Acme White Lead & Color Wks., 8250 St. Aubin Ave., Detroit, Mich. L
Ajax. See Sherwin-Williams Co.
Alaka. See Lacquer & Chemical Corp.
American Di-Electrics, Ltd., Hancock and Bodine, Long Island City, N. Y. V
American Lastite Co., 3166 Lincoln Ave., Chicago.. P L
American Wurtzilite Co., Builders Bldg., Chicago .. P
Antakwa Co., 1329 Mohawk, Chicago, Ill. ..... P
Arizona Lacquer Mfg. Co., 7 16th, Brooklyn, N. Y. L
Armlac. See Robertson Chemical Co.
Arolac. See Arizona Lacquer Mfg. Co.
Art-Craft. See Southwestern Paint & Varnish Co.
Atlantic Chemical Co., Colt, Irvington, N. J. L
Atom Chemical Co., 96 E. 10th, New York, N. Y. L
Bakelite Corp., 247 Park Ave., New York, N. Y. L
Benolite Varnish Co., 501 Columbia Bank Bldg., Pittsburgh ..... V P
Berry Bros., Leib & Wight, Detroit, Mich..... V
Billings-Chapin Co., 1163 E. 40th, Cleveland, O.. V
Biwax Corp., 208 S. La Salle, Chicago, Ill..... P
Bradley-Hurtz Co., 2620 S. Dearborn, Chicago, Ill. L
Brevolite. See Waukegan Chemical Co.
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Chinalac. See Dolph Co., John C.
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J. ..... V P ..
Code 25. See Mitchell-Rand Mfg. Co.
Columbus Varnish Co., 264 Cozzeina, Columbus, O. V ....
Comulac. See Martindale Elec. Co.
Day & Co., James B., 1872 Clybourn Ave. Chicago, Ill. ..... P L
Dolph Co., John C., 168 Emmet, Newark, N. J.. V P ..
Duco. See Du Pont de Nemours & Co.
Du Pont de Nemours & Co., Wilmington, Del.. .. P ..
Durez. See General Plastics.
Eastman Kodak Co., Rochester, N. Y..... L
Eclipse Paint & Mfg. Co., Cleveland, O..... P ..
E. B. See Mitchell-Rand Mfg. Co.
Egyptian Lacquer Mfg. Co., 90 West, New York..... L
Electric Lacquer. See Dolph Co., John C.
Enamelac. See Robertson Chemical Co.
Ever-Brite Products Co., East Liverpool, O..... L
Ferbert-Schorndorfer Co., 12815 Elmwood Ave., Cleveland, O. ..... V P L
Fesco. See Ferbert-Schorndorfer Co.
Five Point. See American Wurtzilite Co.
Franche & Co., 440 Orleans, Chicago, Ill..... L
General Elec. Co., Merchandise Dept., Bridgeport, Conn. ..... V P ..
General Electric Co., Schenectady, N. Y..... P
General Plastics, Inc., 76 Walck Rd., N. Tonawanda, N. Y. ..... V ....
George Co., P. D., 4153 Bingham Ave., St. Louis, Mo. ..... V ....
G. E. See General Elec. Co.
Glidden Co., Cleveland, O. ..... V P L
Glyptal. See General Electric Co., Schenectady.
H. B. See Maas & Waidstein Co.
Hilo Varnish Corp., Marcy & Flushing Aves., Brooklyn, N. Y. ..... V P L
Impervious Varnish Corp., 421 Wood, Pittsburgh. V P ..
Insulaterite. See Ohmlac Paint & Refining Co.
Insulvar. See Varflex Corp.
Irvington Varnish & Insulator Co., Irvington, N. J. V P L
Kodalak. See Eastman Kodak Co.
Krakles. See Waukegan Chemical Co.
Lacquer & Chemical Corp., 214-40th St., Brooklyn, N. Y. ..... P L
Laqueroid. See Glidden Co.
Liberty. See Antakwa Co.
Linolac. See Mica Insulator Co.
Lowe Bros. Co., 450 E. 3rd, Dayton, O..... V P ..
Lucas & Co., John, 322 Race, Philadelphia, Pa.. V P ..
Lucote. See Lucas & Co., John.
Maas & Waldstein, 438 Riverside Ave., Newark, N. J. L
McDougall-Butler Co., Inc., Evans Water & Norton, Buffalo, N. Y. ..... V P ..
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O. ..... V ....
Mawalac. See Maas & Waldstein.
Mecco. See Henry V. Walker Co.
Mica Insulator Co., 200 Varick St., New York.... V ....
M. I. C. See Mica Insulator Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y. V P ..
Nepto Lac. See Lowe Bros. Co.
Nikolas & Co., G. J., 1227 W. Van Buren, Chicago. L
O'Brien Varnish Co., South Bend, Ind..... V P L
Ohmlac Refining Co., 140 S. Dearborn, Chicago, Ill. .. P ..
Opex. See Sherwin-Williams Co.
Ozite. See Standard Underground Cable Co.
P. & B. See Ruberoid Co.
Pacoria Paint Co., 4th & Sedgeley Ave., Philadelphia, Pa. L
Pedigree. See George Co., P. D.
Peninsular Paint & Varnish Co., Detroit, Mich. L
Peerless. See Maas & Waldstein Co.
Proxlin. See Acme White Lead & Color Wks.
Pruett-Schaeffer Chemical Co., Taber, Pittsburgh. .. P L
Reliable Leather Dressing Co., 43 Crescent, Long Island City, N. Y. ..... V ....
Republic Varnish Co., 200 Thomas, Newark, N. J. V ....
Robertson Chemical Co., 9805 Meech Ave., Cleveland, O. ..... V P ..
S. P. C. See Ruberoid Co.
Schenectady Varnish Co., Schenectady, N. Y..... V P ..
Schorndorfer, Ferbert, 12815 Elmwood Ave., Cleveland, O. ..... V P ..
Sherwin-Williams Co., Cleveland, O. ..... V P I
Sipe & Co., James B., Chamber of Commerce Bldg., Pittsburgh, Pa. I
Southwestern Paint & Varnish Co., 610 Broadway, Kansas City, Mo ..... V P ..
Standard Flexible Comp. Co., 1213 Franklin Trust Bldg., Philadelphia, Pa. ..... V P ..
Standard Insulation Co., Rutherford, N. J..... V ....
Standard Lacquer Co., 621 Broadway, New York, N. Y. L
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa. ..... P
Standard Varnish Wks., 443 4th Ave., New York. V P L
Sterling Varnish Co., Haysville, Pa. ..... V ....
Toch Bros., 443 4th Ave., New York..... V P L
Truscon Laboratories, Canift & Grand Trunk Railway, Detroit, Mich. ..... V ....
2098. See Mitchell-Rand Mfg. Co.
Varflex Corp., Rome, N. Y..... V ....
Voltax Co., 99 Reservoir Ave., Bridgeport, Conn. V P ..
Vulcan-Lastite. See American Lastite Co.
Walpole. See Robertson Chemical Co.
Waukegan Chemical Co., North Chicago, Ill L
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Zapon Co., Stamford, Conn. L
Zeilac. See Zeller Lacquer Mfg. Co.
Zeller Lacquer Mfg. Co., 20 E. 49th, New York. L

PANELS (panel) Engraving. See Engraving.
Radio (Metal). See Radio Mountings.
Radio (Molded). See Radio Molded Parts.
Radio (Hard Rubber) See Rubber Hard.
Meters. See Instruments, Portable & Switchboard

PAPER
Boxes. See Boxes & Wrappers.
Bushings. See Tubes, Paper.
Candles. See Candles, Fixture.
Cores. See Tubes, Paper.
Fibre. See Cloth and Paper.
Fish. See Cloth & Paper.
Insulating. See Cloth and Paper.
Parchment. See Parchment Paper.
Shades. See Shades, Fabric.
Sleeves. See Tubes, Paper.

PARAFFINE. See Wax and Compounds.

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Raquette River Paper Co., Potsdam, N. Y.
Reeve & Co., Angel H., 7 Spruce, New York, N. Y.
Rogers Paper Mfg. Co., So. Manchester, Conn.
Special Paper Mfg. Co., 96 Reade, New York, N. Y
Strype, Fred C., 140 Lafayette, New York, N. Y.
Taylor-Logan Co., Holyoke, Mass.
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Warren Parchment Co., Dexter, N. Y.
Weber Co., F., 1220 Buttonwood, Philadelphia, Pa
West Carrollton Parchment Co., West Carrollton, O.
Windsor Locks Paper Mills Co., Windsor Locks, Conn

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Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
National Vulcanized Fibre Co., Wilmington, Del.
White Supply Co., 4347 Duncan, St. Louis, Mo.

PENS, Scorching
Gilbert Supply Co., Independence, Iowa.
Little Speedster. See Gilbert Supply Co.
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Stylectric. See Post Electric Co.

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Asam Bros., 917 Arch, Philadelphia, Pa.
Asam Wright. See Asam Bros.
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Hamilton Engrs. Products Co., Hamilton, Ohio (Music Rolls).

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Elephant Brand. See Phosphor-Bronze Smelting Co
Gilby Wire Co., Riveraide Ave., Newark, N. J.
Phosphor-Bronze Smelting Co., 2200 Washington Ave., Philadelphia, Pa.
Scovil Mfg. Co., Waterbury, Conn.

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Burt, R. C., 327 S. Michigan Ave., Pasadena, Cal
Foto Cell. See Raytheon Mfg. Co.
General Electric Co., Schenectady, N. Y
G-M Laboratories, Inc., Grace & Ravenswood Ave., Chicago.
Kino-Lamp. See Raytheon Mfg. Co.
National Carbon Co., New York, N. Y.
Photon Instrument Corp., 574 Southern Blvd., New York
Radio Elec'l Wks., 150 W. 22nd, New York, N. Y
Visitron. See G-M Laboratories, Inc.
Westinghouse Elec. & Mfg. Co., Mansfield, Ohio

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Biddle, James G., 1211 Arch, Philadelphia, Pa
Foote, Pierson & Co., 75 Hudson, Newark, N. J.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa
Holophane Co., 342 Madison Ave., New York, N. Y.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa
Luxometer. See James G. Biddle.
Mathews. See Foote, Pierson & Co.
National Lamp Wks. of G. E. Co., Cleveland, O

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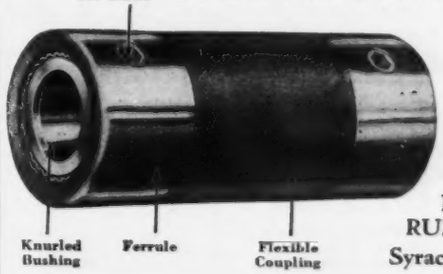

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PHOTOMETERS, Lamp Testing—Continued
PIGTAILS, Commutator. See Brushes, Commutator.
Wire Gauze. See Brushes, Commutator.
Vacuum Cleaner. See Brushes for Vacuum Cleaners.
PINIONS. See Gears and Pinions.
PINION PULLERS. See Pullers, Armature Shaft.
PLASTICS. See Molded Insulation.
PLATES, Name. See Name Plates; Also Decalcomanis
Fixture Outlets. See Fixture Fittings.
Storage Battery. See Plates, Storage Battery.

PLATES, Storage Battery

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Champion. See Englert Mfg. Co.
C. & B. Battery Co., 1535 S. State, Chicago, Ill.
Edes Mfg. Co., Plymouth, Mass.
Englert Mfg. Co., 2500 Jane, Pittsburgh, Pa.
Esto. See New Jersey Storage Battery Co.
Fort Wayne Battery Mfg. Co., 230 E. Fourth, Ft. Wayne.
Handler. See Witherbee Storage Battery Co.
Link & Hemrick, Inc., 555 W. 52nd St., New York, N. Y.
New Jersey Storage Battery Co., 656 Summit Ave., Union City, N. J.
Universal Battery Co., 3410 S. La Salle, Chicago, Ill.
Witherbee Storage Battery Co., 75 Columbus Ave., New York.

PLATING GENERATORS

American Giant. See Connecticut Dynamo Motor Co.
Bogue Elec. Co., Chas. J., 132 King, New York, N. Y.
Burke Elec. Co., Erie, Pa.
Century Electric Co., 1806 Pine, St. Louis, Mo.
Chandeysson Elec. Co., St. Louis, Mo.
Connecticut Dynamox Motor Co., Irvington, N. J.
Conpro. See Eager Elec. Co.
Eager Electric Co., 522 Newell, Watertown, N. Y.
Eclipse. See Fidelity Elec. Co.
Electric Specialty Co., 229 South, Stamford, Conn.
Esco. See Electric Specialty Co.
Fidelity Elec. Co., Lancaster, Pa.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hobart Bros. Co., Troy, O.
Holtzer-Cabot Elec. Co., 125 Amory, Boston, Mass.
Ideal Electric & Mfg. Co., East Third St., Mansfield, O.
Janis & Leist Elec. Co., Cincinnati, O.
Kendrick & Davis Co., Lebanon, N. H.
L'Hommedieu & Sons Co., Chas. F., 4521 Ogden Ave., Chicago, Ill.
Optimus. See Hanson-Van Winkle & Munning Co.
Reliance. See L'Hommedieu & Sons Co., Chas. F.
Westinghouse Elec. Mfg. Co., East Pittsburgh, Pa.

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Atlantic Chemical Co., Coit, Irvington, N. J.
Chromalite. See Metals Protection Corp.
Diamond Chrome. See U. S. Chromium Corp.
Duro Chrome. See General Chromium Corp.
General Chromium Corp., 3220 Bellevue Ave., Detroit, Mich. (Chromium Plate.)
Ideal Plating & Polishing Co., 55 Branford, Newark, N. J.
Metals Coating Co. of America, 495 N. Third, Philadelphia, Pa.
Metals Protection Corp., 401 Michigan, Indianapolis, Ind.
Parker Rust-Proof Co., 2177 E. Milwaukee, Detroit, Mich.
Rochester Elec. Products Corp., 89 Allen, Rochester, N. Y.
United Chromium, Inc., 51 E. 42d, New York, N. Y.
Udylite Process Co., 3220 Bellevue Ave., Detroit, Mich. (Rust-Proof Finish.)
U. S. Chromium Corp., Wilkinsburg Sta., Pittsburgh, Pa.

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Baker & Co., Inc., 54 Austin, Newark, N. J.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Interstate Products Corp., 29 Commercial, Newark, N. J.
Wilco. See H. A. Wilson Co.
Wildberg Bros., Smelting & Refining Co., 742 Market, San Francisco, Cal.
Wilson Co., H. A., Newark, N. J.

PLUG FUSES. See Fuses and Fuse Wire.
PLUG RECEPTACLES. See Receptacles, Plug.
PLUGS, Flashing. See Flashers, Sign.
PLUGS, Radio. See Radio Receiver Parts.

PLUGS, Attachment

A-1 Bakelite. See Connecticut Elec. Mfg. Co.
Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo.
Alcor Mfg. Co., 4605 W. Madison, Chicago.
Anselite Elec. Mfg. Co., New Haven, Conn.
Anylite Elec. Co., Fort Wayne, Ind.
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Arre-Grip. See Arrow Elec.
Beardsley & Wolcott Mfg. Co., Waterbury, Conn.
Beaver Mfg. Co., 636 N. Third, Newark, N. J.
Bee-Ell Elec. Mfg. Co., 79 Mercer, New York, N. Y.
Belden Mfg. Co., 2310 B. S. Western Ave., Chicago, Ill. (Special Soft Rubber Plug Furnished with Belden Cords)
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bryant Elec. Co., Bridgeport.
C. H. See Cutler-Hammer Mfg. Co.
Carling Tool & Machine Co., 33 Union Place, Hartford, Conn.
Cemco. See Connecticut Elec. Mfg. Co.
Cetelite. See Connecticut Moulded Products.
Circle F Mfg. Co., Trenton, N. J.
Colts Patent Fire Arms Mfg. Co., Hartford, Conn.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Connecticut Moulded Products Corp., Meriden, Conn.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Diamond, H. See Hart Mfg. Co.
Dreadnaught. See Cutler-Hammer Mfg. Co.
Eagle Elec. Mfg. Co., Dept. EH4, 50 Hall, Brooklyn, N. Y.
Eastman Mfg. Co., Manitowoc, Wis.
Electric Co., 94 Allyn, Hartford, Conn.
Ericson Mfg. Co., 3257 Bradford Rd., Cleveland, O.
Euler Elec. Mfg. Co., 802 S. Adams, Marion, Ind.
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Fitzall. See Rodale Mfg. Co.
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Gripall. See Beaver Mfg. Co.
Handle Cap. See Speaway Mfg. Co.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Heetach. See Marks Products Co.
Hemco. See Bryant Electric Co.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
H. & H. See Hart & Hegeman.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Iona Co., 416 W. Eighth, Los Angeles, Cal.
Jiffy. See Esler Elec. Mfg. Co.
Kool Plug. See Colt's Patent Fire Arms Mfg. Co.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Marks Products Co., 23 E. 16th, New York.
Metropolitan Electric Mfg. Co., Blvd. at 14th St., Long Island City, N. Y.
Nelco. See Nelson Elec. Co.
Nelson Elec. Co., Plant City, Fla.
P. & S. See Pass & Seymour.
Paragon Elec. Sales Co., 215 S. Fifth, Philadelphia, Pa.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Quartap. See Connecticut Elec. Mfg. Co.
Poloron Elec. Mfg. Co., 20 Bond, New York, N. Y.
Propp Co., M., 524 Broadway, New York.
Quick Catch. See Hubbell, Inc., Harvey.
Real. See Smith & Co., T. C.
Real Diamond. See Smith & Co., T. C.
Reben Electric Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Reneo. See Reben Elec. Mfg. Co.
Reynolds Spring Co., Jackson, Mich.
Reynolite Masterpiece. See Reynolds Spring Co.
Ripple. See Bryant Elec. Co.
Rodale Mfg. Co., 200 Hudson, New York.
Safegard Elec. Appliance Co., 133 S. Twelfth, Philadelphia.
Samson Cutlery Co., 8 Jones, Rochester, N. Y.
Sears, Henry D., 80 Boylston, Boston 11, Mass.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa
Snapit. See Marks Products Co.
Snoco. See Snow & Co., E. W.
Snow & Co., E. W., Rochester, N. Y.
Spartanette. See Bryant Elec. Co.
Spar Tap. See Bryant Elec. Co.
Speedway Elec. Mfg. Co., 30 Church, New York, N. Y.
Standard. See Cutler-Hammer Mfg. Co.
Suitzall. See Beaver Mfg. Co.
Surefit. See Alcor Mfg. Co.
T. E. C. See Electric Co.
Tedco. See Paragon Elec. Sales Co.
Telltale Tap. See General Elec. Co.
Templus. See Bryant Elec. Co.
Torrid. See Beardsley & Wolcott Mfg. Co.
Trio-Tap. See Rodale Mfg. Co.
Triple Tap. See General Elec. Co.
Twin Tap. See General Elec. Co.
United States Elec. Mfg. Co., 222 W. 14th, New York.
Un-X-Ld. See Speedway Elec'l Mfg. Co.
Utilo Mfg. Co., 320 E. Liberty, Lancaster, Pa.
Weber. See Sears, Henry D.
Wellmade Elec. Mfg. Co., Torrington, Conn.
Wilshires. See Iona Co.
Yankee. See Beaver Mfg. Co.

POCKET METERS. See Instruments, Pocket.

POINTS, Contact

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Coffin Mfg. Co., B. F., 30 Court, Newark, N. J. (Platinum and Silver.)
Cohn, Sigmund, 44 Gold, New York, N. Y. (Platinum.)
Elkon, Inc. (Div. of P. R. Mallory Co.), 350 Madison Ave., New York, N. Y.
Fansteel Products Co., North Chicago, Ill.
Hardy Metal Corp., Seattle, Wash.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Independent Contact Mfg. Co., 545 39th, Union City, N. J. (Tungsten.)
Interstate Products Corp., 29 Commercial, Newark, N. J. (Platinum and Silver.)
Kinz Mfg. Corp., Rano & Crowley Sts., Buffalo, N. Y. (Platinum.)
National Contact Co., 33 W. 60th, New York. (Platinum.)
Niehoff & Co., C. E., 230 W. Superior, Chicago. (Platinum.)
Spark-O-Metal. See Hardy Metal Corp.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., Newark, N. J. (Platinum and Silver.)

POLARITY INDICATORS. See Instruments, Pocket.
POLISHING MACHINES, WIRE. See Wire Polishing Machines.

PORCELAIN

Bushings. See Bushings, Box & Cabinet.
Liquid. See Cement, Liquid Porcelain.
Molding Machine. See Presses, Porcelain Molding.
Reflectors (Enameled). See Reflectors, Porcelain Enameled.
Refractory. See Cores, Resistance Coil.

PORCELAIN, Special Shapes

Akron Porcelain Co., Akron, Ohio.
American Porcelain Co., E. Liverpool, O.
A. P. See Akron Porcelain Co.
Burgess & Co., East Liverpool, O.
Central Porcelain Co., Columbiana, O.
Circle F Mfg. Co., Trenton, N. J.
Colonial Insulator Co., Akron, O.
Connecticut Porcelain Co., Trenton, N. J.
Cook Pottery Co., Trenton, N. J.
Corns China Co., Wellsville, O.
Crowley & Co., Henry L., 545 N. Arlington Ave., East Orange, N. J.
Electrical Refractories Co., East Palestine, O.
Globe Porcelain Co., Mulberry St. and St. Joes Ave., Trenton, N. J.
Hartford Faience Co., Hartford, Conn.
Hub-Way Mfg. Co., Hubbard, Ohio.
Illinois Electric Porcelain Co., Macomb Ill.
Imperial Porcelain Wks., Canal and Mulberry, Trenton, N. J.
Knox Porcelain Corp., Knoxville, Tenn.
Louthan Mfg. Co., East Liverpool, O.
Mercer Porcelain Co., Trenton, N. J.
Metsch Refractories Co., East Liverpool, Ohio.
National Porcelain Co., Trenton, N. J.
New Jersey Porcelain Co., Trenton, N. J.
Nu Blac. See Star Porcelain Co.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y
Porcelava. See Burgess & Co.
Porcelain Products, Inc., Findlay, Ohio.
Square D Company, Detroit, Mich.
Standard & Specialty Porcelain Co., Sun Prairie, Wis
Star Porcelain Co., Muirhead St., Trenton, N. J.
Thomas & Sons Co., R., Lisbon, O.
Trenton Porcelain Co., East Liverpool, Ohio.
Union Elec'l Porcelain Wks., Inc., Trenton, N. J.
Washington Porcelain Co., Washington, N. J.
Woolley, Inc., W. Douglas, East Liverpool, O.

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Maddocks Sons, John, Trenton, N. J.
Ohio Pottery Co., Zanesville, Ohio.
Robinson Clay Products Co., Akron, Ohio.

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Binding Posts, Switch Parts, Stop Points, Contacts, Arms, Levers. See also Radio Mountings.
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Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Chapman Machine Co., Terryville, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
DeJur-Amsco Corp., 418 Broome, New York, N. Y.
Eby Mfg. Co., Inc., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Ensign. See Eby Mfg. Co., H. H.
Eureka. See Frank W. Morse Co.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Gray Bros., Plano, Ill.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
King. See Morse Co., Frank W.
Morse Co., Frank W., 289 Congress, Boston. (Spring Grip.)
Nutmeg. See Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co.
Polk, J. L., 41 Bell Ave., Troy, N. Y.
Premier Elec. Co., 1802 Grace, Chicago, Ill.
Quality. See H. H. Eby Mfg. Co.
Queen. See Morse Co., Frank W.
Thomaston Mfg. Co., Thomaston, Conn.
Waterbury Button Co., Waterbury, Conn.

POTENTIOMETERS (Instruments). See Instruments, Laboratory Standard.
POTENTIOMETERS (Radio Control). See Radio Receiver Parts.
POWDERED CARBON. See Carbon, Powdered.
POWER TRANSMISSION CHAIN. See Chain, Power Transmission.
PRESS BOARD. See Cloth and Paper.

PRESSES, Armature Coil

Comstock Mfg. Co., Wilkes-Barre, Pa.

PRESSES, ARMATURE NOTCHING. See Notching Machines, Armature.

PRESSES, Molded Insulation

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Dunning & Boschert Press Co., 329 W. Water, Syracuse
Elmes Engrg. Works, Chas. F., 230 N. Morgan, Chicago.
Evans Engrg. Works, Chas. E., 1002 Fulton, Chicago, Ill
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French Oil Mill Machinery Co., Piqua, O.
Southwark Fdy. & Mach. Co., 400 Washington Ave., Philadelphia, Pa.
Stokes Mach. Co., F. J., 5926 Tabor Rd., Olney, Philadelphia, Pa.
Terkelson Machine Co., 326 A, Boston, Mass.
Watson-Stillman Co., 75 West St., New York, N. Y
Wood & Co., R. D., Florence, N. J.

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PRESSES, Punching

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Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., 53rd St. & Second Ave., Brooklyn, N. Y
Federal Press Co., Elkhart, Ind.
Ferracute Machine Co., Bridgeton, N. J.
Hyre Mfg. Co., 200 Varick, New York, N. Y.
Loathough-Jordan Tool & Machine Co., Elkhart, Ind.
Peck, Stow & Wilcox Co., Southington, Conn.
Rockford Iron Works, 846 Ray, Rockford, Ill.

PRISMS, Chandelier. See Crystals, Chandelier.
PROJECTOR LENSES. See Lenses.

PULLERS, Armature Shaft

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Allen Electric & Equipment Co., Kalamazoo, Mich.
Big Buster. See Premier Elec. Co.
Crane Puller Co., Waltham, Mass.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff Mfg. Company, Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts. Philadelphia, Pa.
Little Giant. See Premier Elec. Co.
Peerless. See Electric Service Supplies Co.
Premier Electric Co., 1802 Grace, Chicago, Ill.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill

PULLEYS, Composition

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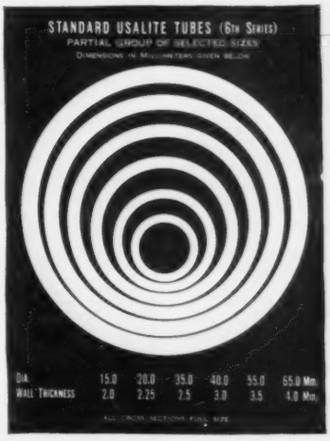
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Reflex. See Simplex Oil Heating Co.
Simplex Oil Heating Co., 1199 Eddy, Providence, R. I.
Teesdale Mfg. Co., 427 Market, Grand Rapids, Mich.
Zisch Engineering Co., 39 Ave. L, Newark, N. J.

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Dunham Co., C. A., 450 East Ohio, Chicago, Ill.
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Eisler Elec. Corp., 756 S. 13th, Newark, N. J.
General Electric Co., Schenectady, N. Y.
Hubbard's Sons, Norman, 1 Carlton Ave., Brooklyn, N. Y.
Leiman Bros., 23 Walker, New York, N. Y.
Packard. See Hubbard's Sons, Norman.

PUNCHING PRESSES. See Presses, Punching.

PUNCHING and BENDING, Sheet Steel

Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Niagara Mach. & Tool Wks., Buffalo, N. Y.

RACKS, Wire Reel

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Browning. See Mutual Foundry & Machine Co.
Chapman Elec'l Wks., P. E., 1828 Chouteau Ave., St. Louis, Mo. (Tensionless Dereeler)
Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Elec. Co., Schenectady, N. Y. (Tension Indicator.)
Mutual Foundry & Machine Co., Atlanta, Georgia.
Segur. See Electric Service Supplies Co.

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Acme Products Co., Boston, Mass.
Acme Wire Co., New Haven, Conn.
Aero-Call. See Aero Products, Inc.
Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y.
Aero Products, Inc., 4611 Ravenswood Ave., Chicago, Ill.
Air-King Products Co., 216 Wallabout, Brooklyn, N. Y.
Ajax Elec. Specialty Co., St. Louis, Mo.
Alden Mfg. Co., Springfield, Mass.
All-American Mohawk Corp., 4201 Belmont Ave., Chicago.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Amerchoke. See American Transformer Co.
American Apparatus Co., Richmond, Ind.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
American Transformer Co., Newark, N. J.
Amperite Rheostat. See Radiall Co.
Arco Elec'l Corp., 211 E. Columbia, Fort Wayne, Ind.
Arctic See Premier Elec. Co.
Art Dial. See Pilot Radio & Tube Corp.
Audioformer Transformer. See Pacent Electric Co.
Autoformer. See Thordarson Elec. Mfg. Co.
Automotive Parts Mfg. Co., 70 Washington St., Brooklyn,
B-Conomizer. See Pilot Radio & Tube Corp.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bonine. See Turn-it Radio Sales.
Branston Co., Chas. A., 297 Washington, Buffalo, N. Y.
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn, N. Y.
Browning-Drake Corp., Calvary, Waltham, Mass.
Buffer. See Aerovox Wireless Corp.
Buffalo. See De Jur-Amsco Corp.
Camfield. See Columbia Metal Products Co.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Capacigrad. See Pilot Radio & Tube Corp.
Cardwell Mfg. Corp., Allen D., 81 Prospect, Brooklyn, N. Y.
Carter Mfg. Co., 6306 Euclid Blvd., East Cleveland, O.
Carter Radio Co., 407 S. Aberdeen, Chicago, Ill.
Central Radio Corp., Beloit, Wis.
Centraline. See Pilot Radio & Tube Corp.
Certified Condenser. See Radio Condenser Co.
Chelten Elec. Co., 4859 Stenton Ave., Philadelphia, Pa.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Clarostat Mfg. Co., 281 N. Sixth, Brooklyn, N. Y. (Radio Resistance.)
Cole Radio Mfg. Corp., 536 Bloomfield Ave., Bloomfield, N. J.
Columbia Metal Products Co., 360 E. Grand Ave., Chicago,
Concertone. See Chicago-Jefferson Fuse.
Connectoraids. See Alden Mfg. Co.
Continental Carbon, Inc., Cleveland, O.
Continental. See Gardiner & Hepburn, Inc.
Cornell Elec. & Mfg. Co., Anable & Rawson, Long Island City, N. Y.
Crosradio Corp., 166-32 Jamaica Ave., Jamaica, N. Y.
Crefot. See Premier Elec. Co.
Daven Corp., 158 Summit, Newark, N. J. (Kits)
DeForest Radio Co., Jersey City, N. J.
De Jur-Amsco Corp., 418 Broome, New York, N. Y.
Diamond Weave Coil. See Sickles Co., F. W.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Dubilier Condenser Corp., 342 Madison av., New York.
Dumont Elec. Co., 40 W. 17th, New York, N. Y.
Duratran. See Dubilier Condenser Corp.
Durham & Co., 1936 Market, Philadelphia, Pa.
Dymac. See Electrical Products Mfg. Co.
Dynohmic. See Lynch, Inc.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Products Mfg. Co., Providence, R. I. (Kit.)
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill.
Electro Motive Engineering Corp., 127 W. 17th, New York.
Elkay. See Langbein Kaufman Radio Co.
Elkon, Inc., 350 Madison Ave., New York, N. Y.
El Menco. See Electro Motive Engineering Co.
Equamatic Kit. See Karas Elec. Co.
Equitrol. See Cardwell Mfg. Corp.
E-Z. See Polymet Mfg. Corp.
Faradon. See Wireless Specialty Apparatus Co.
Fast Co., John E., 3982 Barry Ave., Chicago, Ill.
Ferranti, Inc., 130 W. 42nd, New York, N. Y.
Filatrol. See De Jur-Amsco Corp.
Filtrola. See All-American Mohawk Corp.
Flechtheim Co., A. M., 138 Liberty, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Frost, Inc., Herbert H., 1142 W. Beardsley, Elkhart, Ind.
F. & H. Radio Laboratories, Fargo, N. D.
Gardiner & Hepburn, Inc., 611 Widener Bldg., Philadelphia, Pa.
General Instrument Corp., 225 Varick, New York, N. Y.
General Radio Co., 30 State Cambridge, Mass.
General Transformer Corp., 910 W. Jackson Blvd., Chicago.
General Winding Co., 214 Fulton, New York, N. Y.
Gen-Win. See General Winding Co.
Glastor. See Daven Corp.
Globar Corp., Niagara Falls, N. Y.
Glo-Dial. See Wireless Radio Corp.
Gray & Danielson Mfg. Co., 260 1st, San Francisco, Cal.
Halldorson Co., 4745 N. Western Ave., Chicago, Ill.
Hamilton-Sangamo Corp.
Hammarlund Mfg. Co., 424 W. 33rd, New York, N. Y.
Hardwick, Hindle, Inc., 122 Greenwich, New York, N. Y.
Harmonik. See Karas Elec. Co.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. (TRF Kits.)
Hedgehog Transformer. See Premier Elec. Co.
Heinemann Elec. Co., Trenton, N. J.
Held-Tite, Hi-ohm, Hi-pot. See Carter Radio Co.
Hi-Q Kit. See Hammarlund.
Hum-Dinger. See Clarostat Mfg. Co.
Hy-Wat. See Electro Motive Engineering Corp.
Igrad Condenser & Mfg. Co., 26 Avenue D, Rochester, N. Y.
Infra-Dyne. See Gray & Danielson Co.
International Resistance Co., 2006 Chestnut, Philadelphia, Pa.
Isograd, Isoleak. See Pilot Radio & Tube Corp.
J-M-P. Mfg. Co., 3320 Fond du Lac Ave., Milwaukee, Wis.
Karas Elec. Co., 4040 N. Rockwell, Chicago, Ill.
Kelford. See American Specialty Co.
Kenyon Transformer Co., 122 Cypress Ave., New York, N. Y.
Kilograd. See Pilot Radio & Tube Corp.
Krobiack. See Mountford, C. E.
Kuprox. See Kodel Radio Corp.
Langbein-Kaufman Radio Co., 62 Franklin, New Haven, Conn.
Lavite. See Aerovox Wireles Corp.
Lautz Mfg. Co., 245 N. J. R. R. Ave., Newark, N. J. (Radio Resistance).
Lekeless. See Benjamin Elec. Mfg. Co.
Lemnis. See General Winding Co.
L. M. C. See Lautz Mfg. Co.
Loftin-White. See Hammarlund Mfg. Co.
Loless. See Wireless Radio Corp.
Lynch, Arthur H., 1775 Broadway, New York, N. Y.
Marco. See Martin-Copeland Co.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Maxitran. See Electrical Research Laboratories.
Mayolian Corp., 1668 Webster Ave., New York, N. Y. (Tone Filter.)
Meggit. See Cole Mfg. Corp.
Meico-Supreme. See De Jur-Amsco Corp.
Meicoupler. See Robertson-Davis Co.
Meloformer. See Robertson-Davis Co.
Metaleak. See Dubilier Condenser Corp.
Metralign. See General Instrument Corp.
Micadon Condenser. See Dubilier Condenser Corp.
Micamold Radio Corp., 1087 Flushing Ave., Brooklyn, N. Y. (Amplifier Kit.)
Mica-Static. See Dubilier Condenser Corp.
Micon Condenser. See Dubilier Condenser Corp.
Microcondenser. See Sterling Mfg. Co.
Microgrid. See Pilot Radio & Tube Corp.
Micrometric. See Karas Elec. Co.
Microstat. See Premier Elec. Co.
Midline. See Hammarlund Mfg. Co.
Modern Electric Mfg. Co., Toledo, O.
Mountford, C. E., 30 Sullivan, New York, N. Y.
Muter Co., Leslie F., 8440 S. Chicago Ave., Chicago, Ill. (Amplifier Kits.)
National Co., 61 Sherman St., Malden, Mass.
Neutro-Grad. See Pilot Radio & Tube Corp.
New York Coil Co., Mount Clare, Pa.
Nutmeg. See Hart & Hegeman Mfg. Co.
Ohio Carbon Co., 8215 Almira Ave., Cleveland, O.
Ohmite Mfg. Co., 643 N. Albany Ave., Chicago, Ill (Resistance.)
One Way. See Carter Radio Co.
Orthometric. See Karas Elec. Co.
Orthophone. See De Jur-Amsco Corp.
Pacent Electric Co., 91 7th Ave., New York, N. Y.
Pam. See Samson Elec. Co.
Panatrol See Wireless Radio Corp.
Perry Elec'l Resistor Corp., 280 New Main St., Yonkers N. Y.
Phasatrol. See Electrad, Inc.
Philmore Mfg. Co., 106 7th Ave., New York, N. Y.
Piander. See De Jur-Amsco Corp.
Pierce Airo. See United Scientific Laboratories.
Pilot Radio & Tube Corp., 323 Berry, Brooklyn, N. Y.
Pilotran. See Pilot Radio & Tube Corp.
Potter Mfg. Co., North Chicago, Ill.
Polymet Mfg. Corp., 599 Broadway, New York, N. Y.
Power Box. See Scott Sales Co.
Powerohm. See International Resistance Co.
Powrad, Inc. 486 Johnson Ave., Brooklyn, N. Y.
Precision Coil Co., 122 Greenwich, New York, N. Y.
Precise Mfg. Corp., 254 Mill, Rochester, N. Y.
Premier Elec. Co., 1802 Grace, Chicago, Ill. Chicago, Ill.
Protectoraid. See Alden Mfg. Co.
Pyrohm. See Aerovox Wireless Corp.
Radiall Co., 50 Franklin, New York, N. Y.
Radio Appliance Corp., Springfield, Mass.
Radio Condenser Co., Thorn & Copewood, Camden, N. J.
Radio Engrg. Laboratories, 100 Wilbur Ave., Long Island City, N. Y. (Short Wave Kit.)
Radiolce Switch. See Cutler-Hammer Mfg. Co.
Radio Receptor Co., 106 7th Ave., New York.
Radiostat. See Allen-Bradley Co.
Raola. See Modern Elec. Mfg. Co.
Rauland-Lyric. See All American Mohawk Corp.
Receptrad. See Radio Receptor Co.
Reesonator. See F. & H. Radio Laboratories.
Regal. See American Specialty Mfg. Co.
Reliable Parts Mfg. Co., Wellington, O.
Remler. See Gray & Danielson Co.
Resistaformer. See Aerovox Wireless Corp.
Resistograd. See Pilot Radio & Tube Corp.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent), Hatheway & Co., 16 Hudson, New York, N. Y.
Roberts Condenser. See Hammarlund Mfg. Co.
Robertson-Davis Co., 412 Orleans, Chicago, Ill.
Ramsen Elec. Co., Canton, Mass. (TRF Kits.)
Scovill Mfg. Co., Waterbury, Conn.
Senior. See All American Mohawk Corp.
Sensory. See Heinemann Electric Co.
Sevison Magneto Engr. Co., 397 Phillips, Toledo, O.
Sickles Co., F. W., 130 Union, Springfield, Mass.
Signal Elec. Mfg. Co., Menominee, Mich.
Silver-Marshall, Inc., 6401 W. 65th St., Chicago. (Amplifier Kits.)
Silvertone. See Radio Receptor Co.
S. L. S. See Wireless Radio Corp.
S. L. T. See General Instrument Corp.
Somersolo. See DeForest Radio Co.
Splitmeter. See Premier Electric Co.
Sprague Specialties Co., Dept. M., Quincy, Mass.
Standard Transformer Co., Warren, O.
Sta-Put. See Martin-Copeland Co.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, O.
Stromberg-Carlson Tel. Mfg. Co., 1060 University Ave. Rochester, N. Y.
Submariner. See J-M-P Mfg. Co.
Super Multiformer. See Precise Mfg. Corp.
Supertran Transformer. See Ford Radio & Mica Co.
Symphony. See Modern Elec. Mfg. Co.
Synerodenser. See Precise Mfg. Corp.
Telemonic Coil. See Condenser Corp. of America.
Telos Coil. See Condenser Corp. of America.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thordarson Elec. Mfg. Co., Huron & Kingsbury Sts., Chicago
Tobe Deutschman Co., Canton, Mass.
Tone Control. See Sprague Specialties Co.
Toroid. See All American Mohawk Corp.
Transcript-Clapp Kit. See Samson Electric Co.
Truphonic Amplification. See Alden Mfg. Co.
Tunadapta. See Lynch, Arthur H.
Tuway. See Carter Radio Co.
Twin-aud. See Peerless Radio Co.
Twin-Eight Transformers. See Bodine Electric Co.
Two-Ten & Two-Eleven. See Sliver-Marshall.
Tyrman Elec. Corp., 314 W. Superior, Chicago, Ill.
Ultra Vario. See Bruno Radio Corp.
Univernier Condenser. See Auburn Button Works.
Universal Electro Chemical Corp., 30 W. 15th, New York.
Universal Winding Co., Boston, Mass.
Variall Condenser. See Muter Co.
Volta. See Universal Electro Chemical Corp.
Volumgrad. See Pilot Radio & Tube Corp.
Walbert Radio Corp., 1000 Fullerton Ave., Chicago, Ill.
Waterbury Button Co., Waterbury, Conn.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn, N. Y.
Wireless Specialty Apparatus Co. (J. P.), Boston, Mass

RADIO HARDWARE. See Radio Mountings.

RADIO MOUNTINGS

Coil Mountings, Coil Sliders and Rods, Switches, Detectors, Detector and Grid Leak Mountings, Panel Brackets, Special Radio Hardware & Trimmings, Metal Dials, Metal Panels, etc.

Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y.
Alden Mfg. Co., Brockton, Mass.
American Emblem Co., Utica, N. Y.
American Radio Hardware Co., 135 Grand, New York.
Bonza. See Haydon & Haydon.
Carborundum Co., Niagara Falls, N. Y. (Detector.)
Chapman Machine Co., Terryville, Conn.
De Jur-Amsco Corp., 418 Broome, New York, N. Y.
Durham & Co., 1936 Market, Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Etched Products Corp., 90 Tenth, Long Island City, N. Y. (Metal Panels.)
Eureka. See Morse Co., Frank W.
General Etching & Mfg. Co., 3072 West Grand Ave., Chicago, Ill. (Metal Panels & Escutcheons.)
Globe Technolian Corp., Reading, Mass.
Glodial. See Wireless Radio Corp.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Haydon & Haydon, 167 Chambers, New York, N. Y.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Muter Co., Leslie F., 8440 S. Chicago Ave., Chicago.
Na-Ald. See Alden Mfg. Co.
Union Insulating Co., 296 Broadway, New York, N. Y.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn.
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.

RADIO PANEL ENGRAVING. See Engraving, Radio Panel.

RADIO RECEIVER PARTS

Rheostats, Sockets, Plugs, Jacks.

Acme Elec. & Mfg. Co., 1652 Rockwell, Cleveland, Ohio.
Alden Mfg. Co., Springfield, Mass.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Amacostat. See American Apparatus Co.
American Apparatus Co., Richmond, Ind.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport Conn.
Automotive Equipment Co., 317 Halsey, Newark, N. J.
B. M. S. See Brooklyn Metal Stamping Corp.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. (Multiple Plugs.)
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Brach Mfg. Corp., L. S., 120 Sussex Ave., Newark, N. J.
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn.
Cabeleg. See Jones, Howard B.
Carter Radio Co., 407 S. Aberdeen, Chicago, Ill. (Also Socket Adapters.)
Central Radio Laboratories, 14 Keefe Ave., Milwaukee
Centraline. See Central Radio Laboratories.
Clarostat Mfg. Co., 285 N. Sixth, Brooklyn, N. Y.
Cle-Ra-Tone. See Benjamin Elec. Mfg. Co.
D. A. Radio Co., 30 Hollister, Buffalo, N. Y.
De Jur-Amsco Corp., 418 Broome, New York, N. Y.
De Vaau. See Stanley & Patterson.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Duostat. See De Jur-Amsco Corp.
E-Z. See Polymet Mfg. Corp.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Products Mfg. Co., Providence, R. I.
Fantail Plug. See Brooklyn Metal Stamping Corp.
Frost, Herbert H., 1142 W. Beardsley, Elkhart, Ind
Gem-Jac. See Frost, Herbert H.
General Instrument Corp., 225 Varick, New York, N. Y.
General Radio Co., 30 State, Cambridge, Mass.
Gray & Danielson Mfg. Co., 260 First, San Francisco, Cal.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Heinemann Elec. Co., Trenton, N. J.
Imp. See Carter Radio Co.
Jones, Howard B., 2300 Wabansia, Chicago. (Multiple Plug)
Klosner Radio Corp., 1022 E. 178th, New York, N. Y.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Microgrid. See Pilot Radio & Tube Corp.
Modu-Plug. See Central Radio Lab.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Muter Co., Leslie F., 8440 S. Chicago Ave., Chicago.
Nutmeg. See Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co.
Pacent Elec. Co., 91 Seventh Ave., New York, N. Y.
Pan-Tab Jack. See Frost, Herbert H.
Philmore Mfg. Co., 106 Seventh Ave., New York, N. Y.
Pilot Radio & Tube Corp., 323 Berry, Brooklyn, N. Y.
Polymet Mfg. Corp., 599 Broadway, New York, N. Y.
Premier Elec. Co., 1802 Grace, Chicago, Ill.
Recto Mfg. Co., 23 W. Third, Cincinnati, Ohio.
Robertson-Davis Co., 361 W. Superior, Chicago, Ill.
Royalty See Electrad, Inc.
Samson Elec. Co., Canton, Mass.
Socostat. See D. A. Radio Co.
Stanley & Patterson, 150 Varick, New York, N. Y.
Sterling Mfg. Co., 2831 Prospect Ave. Cleveland, Ohio.
Tubesat. See Muter Co.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.

RADIO RECTIFIER TUBES

Armstrong Electric Co., 187 Sylvan Ave., Newark, N. J.
Arcturus Radio Tube Co., 260 Sherman Ave., Newark, N. J.
Cable Radio Tube Corp., 80 N. Ninth, Brooklyn, N. Y.
Ceco Mfg. Co., 702 Eddy, Providence, R. I.
Conneway Elec. Laboratories, 406 Jefferson, Hoboken, N. J.
Cunningham, Inc., E. T., 370 Seventh Ave., New York, N. Y.
DeForest Radio Co., Franklin St. & Central Ave., Jersey City, N. J.
Diamond Electric Co., Newark, N. J.
Diamond Vacuum Products Co., 4053 Diversey Ave., Chicago
Eveready Raytheon. See National Carbon Co.

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Hygrade Lamp Co., Salem, Mass.
Jaeger Research Laboratories, 280 Park Ave., Weehawken, N. J.
Ken-Rad Tube & Lamp Corp., Owensboro, Ky.
La Salle Radio Corp., Div. of Matchless Elec. Co., 1500 N. Ogden Ave., Chicago, Ill.
Manhattan Elecl. Supply Co., 510 Sixth Ave., New York.
National Carbon Co., New York, N. Y.
Neptron. See Hygrade Lamp Co.
Northern Mfg. Co., 367 Ogden, Newark, N. J.
Paramount Mfg. Co., 79 Orange, Newark, N. J.
Perryman Electric Co., North Bergen, N. J.
Radio-Victor Corp. of America, 233 Broadway, New York.
Sonatron Tube Co., 1020 S. Central Park Ave., Chicago, Ill.
Specialty Appliance Co., 6611 Euclid Ave., Cleveland, Ohio.
Sylvania Products Co., Emporium, Pa.
Teleyocal Corp., 583 Twelfth, West New York, N. J.
United Radio & Elec. Corp., 500 Chancellor Ave., Irvington, N. J.

RADIO TRANSFORMERS. See Radio Circuit Components.

RADIO TUBE BASE BRANDERS. See Engraving Radio Panel.

RADIO TUBE BASES. See Radio Molded Parts.

RADIO TUBE BULBS (Unfinished). See Bulbs, Glass.

RADIO WIRING HARNESS

Special wiring cable and harness assemblies for radio battery connections, radio tube adapter harness for converting battery operated receivers to A.C. operation; Socket Adapters for Power Tubes; Loud Speaker Extension Cords—This heading also includes auto ignition assemblies.

Afco. See American Fabric Co.
Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo.
Alden Mfg. Co., Brockton, Mass. (Adapters.)
Alpbus. See Alpha Radio Supply Co.
Alpha Radio Supply Co., 520 Broadway, New York, N. Y.
Alpstrand. See Alpha Radio Supply Co.
American Braiding Co., Holyoke, Mass.
Belden Mfg. Co., 2310B W. Western Ave., Chicago, Ill.
Birnbach Radio Co., 254 W. 31st St., New York, N. Y.
Blue Ribbon. See Crescent Braid Co.
Brach Mfg. Co., L. S., Newark, N. J.
Connectoralds. See Alden Mfg. Co.
Cornish Wire Co., 30 Church, New York, N. Y.
Corwico. See Cornish Wire Co.
Crescent Braid Co., Providence, R. I.
Crescent Insulated Wire & Cable Co., Trenton, N. J.
De Luxe, 50 W. Houston, New York, N. Y.
Diamond Braiding Mills, Chicago Heights, Ill.
Echo. See Cornish Wire Co.
Enterprise Mfg. Co., Third & Dauphin Sts., Philadelphia, Pa. (Adapters).
Frost, Inc., Herbert H., 1142 W. Beardsley, Elkhart, Ind. (Adapters.)
Hatfield Rubber Wks., Inc., Hillside, N. J.
Lusterized. See American Braiding Co.
Manhattan Insulated Wire Co., 17 W. 60th St., New York.
Power, Inc., Harold J., Medford Hillside, Mass. (Adapters).
Radio Receptor Co., 106 Seventh Ave., New York, N. Y. (Adapters.)
Riga. See Birnbach Radio Co.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio. (Adapters).
Wilkens Mfg. Co., 52 Orawaupun St., White Plains, N. Y.

RADIUM POWDER AND PAINT

Radium Dial Co., 3332 Forbes, Pittsburgh, Pa.
Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y.

RANGE SWITCHES, Rotary Snap. See Switches, Snap, Heavy Duty.

RAWHIDE GEARS. See Gears & Pinions, Rawhide.

READING LAMP BASES. See Bases, Reading Lamp.

REAMERS, Pipe. See Stocks, Dies and Reamers.

RECEPTACLES, Lamp. See Sockets and Receptacles.

RECEPTACLES, Plug, Heavy Duty

	KEY
Battery Charging	See B
Floor Boxes	See F
Welding	See W
Machine Tool	See W
Watertight, Marine, Mine	See M
Car Trailer Connection	See C
Extension	See E

A. B. C. See Anderson Mfg. Co.
Adam Electric Co., Frank, St. Louis, Mo. F
Adapti Co., 2998 E. 72nd, Cleveland, O.. F
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass. B W M C E
Appleton Elec. Co., 1703 Wellington Ave., Chicago, Ill. M
Arktite. See Crouse-Hinds Co.
Arnessen Electric Co., 13 Water, New York M
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.. F B W
Auth Electrical Specialty Co., 422 E. 53rd, New York, N. Y. E
Benjamin Elec. Mfg. Co., Des Plaines, Ill. F .. W M
Bryant Elec. Co., Bridgeport, Conn. (Also Range Type.) W
Campbell. See Steel City Elec. Co.
Cannon Elec. Development Co., 420 West Ave. 33, Los Angeles, Cal. F
C. E. M. Co. See Conn. Elec. Mfg. Co.
C. H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. M
Conduletto. See Crouse-Hinds Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn. F
Cory & Son, Chas., 183 Varick, New York .. M
Crouse-Hinds Co., Syracuse N. Y. B W
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis. F
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa. C
Elwell Parker Elec. Co., 4223 St. Clair Ave., N. E., Cleveland, O. B
Fielding. See Stanley & Patterson.
Fountain's. See Jenkins Mfg. Co.
Fullman Mfg. Co., Latrobe, Pa. F
Fullman. See Steel City Elec. Co.
General Elec. Co., Merchandise Dept., Bridgeport, Conn. B
Gleason & Co., J. L., 241 Franklin, Boston, Mass. E
H. & H. See Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.. B W
Hessel Co., W. F., 76 Greenwich, New York, N. Y. W M .. E
Hubbell, Inc., Harvey, Bridgeport, Conn. (Also Range Type.) B W

Indestructible. See Kliegl Bros. Universal.
Jenkins Mfg. Co., Bloomfield, N. J. E
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y. F B W M
Latrobe. See Fullman Mfg. Co.
Loeffelholz & Co., Milwaukee, Wis. C
Major Equipment Co., 4603 Fullerton ave., Chicago, Ill. M
Neco. See Novelty Elec. Co.
NePage McKenny Co., Seven Front, Seattle, Wash. F
Novelty Elec. Co., Tench & Cherry Sts., Philadelphia, Pa. C
Ohio Elec. & Controller Co., 5903 Maurice Ave., Cleveland, Ohio. W
Ostrander Elecl. Works, W. R., 911 Atlantic Ave., Brooklyn, N. Y.
Preset. See Walker Bros. Co.
Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill. W M C E
Quadrangle Mfg. Co., 32 S. Peoria, Chicago, Ill. (Combination wall bracket and convenience outlet.)
Raleo Mfg. Co., 123 N. Albany Ave., Chicago, Ill.
Russell & Stoll Co., 53 Rose, New York F B W M .. E
Square D. Co., Detroit, Mich. W
Stanley & Patterson, 150 Varick, New York, N. Y. F
Steel City Elec. Co., Pittsburgh, Pa.. F E
Thomas & Betts Co., 15 Park Place, New York, N. Y. F
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa. M
Walker Bros., 1417 Sansom, Philadelphia F E
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. F B W M
Yale. See Electric Products Co.

RECORDERS, Elapsed Time. See Indicators, Operation.

REDUCERS, Socket. See Socket Reducers.

REFLECTOR LENSES. See Lenses.

REFLECTORS, Porcelain Enameled, Steel

4-Bolite Reflector Co., 7500 Sherman Ave., Cleveland, O
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Cello, Inc., 98 Prince, New York, N. Y.
Dunlap Co., John, Carnegie, Pa.
Durex. See Wheeler Reflector Co.
Federal Electric Co., 8700 S. State, Chicago, Ill.
Goodlites. See Goodrich Elec. Co.
Goodrich Elec. Co., 1650 Ogden Ave., Chicago, Ill.
Isolux. See Wheeler Reflector Co.
Ivanhoe Division of Miller Co., Cleveland.
Jumbo. See Quadrangle Mfg. Co.
Marbelite Art Products Co., 140 N. Robey, Chicago, Ill.
Monk, H. E., 18 Warren, New York, N. Y.
Multi Elecl. Mfg. Co., 210 N. Ogden Ave., Chicago, Ill.
Oamed. See Overbaugh & Ayers.
Overbaugh & Ayers, 411 S. Clinton, Chicago, Ill.
Para Steel. See Wheeler Reflector Co.
Perfection. See Tindall & White.
Philadelphia Elec'l & Mfg. Co., 1228 N. 31st, Philadelphia.
Quad. See Quadrangle Mfg. Co.
Quadrangle Mfg. Co., 32 S. Peoria, Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Sturdox. See Benjamin Elec. Mfg. Co.
Tindall & White, 33 W. 60th, New York, N. Y.
Vaporlux. See Wheeler Reflector Co.
Westinghouse Elec. & Mfg. Co., South Bend, Ind.
Wheeler Reflector Co., 275 Congress, Boston, Mass.

REFRIGERANTS. See Chemicals, Refrigeration.

REFRIGERATION CHEMICALS. See Chemicals, Refrigeration.

REFRIGERATOR CABINETS

Airtite. See Rhinelander Refrigerator Co.
Alaska Refrigerator Co., Muskegon, Mich.
American Refrigerator Corp., Peru, Ind.
Arlington Refrigerator Co., Arlington, Vt.
Athermos. See Gurney Refrigerator Co.
Baldwin Refrigerator Co., Burlington, Vt.
Banta Refrigerator Co., Clearfield, Pa.
Belding-Hall ElectrICE Corp., Belding, Mich.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bohn Refrigerator Co., St. Paul, Minn.
Cavalier. See Tennessee Furniture Co.
Challenge Refrigerator Co., Grand Haven, Mich.
Champion Refrigerator Co., 206 Lexington Ave., New York.
Crystal Refrigerator Co., Fremont, Neb.
Crysteel. See Benjamin Elec. Mfg. Co.
Dry-Air. See Baldwin Refrigerator Co.
Dry-Cold. See Hill & Co.
Economic. See Leonard Refrigerator Co.
Eddy & Sons Co., D., 336 Adams, Boston, Mass.
Erie Art Metal Co. & Erie Metal Furniture Co., Erie, Pa.
General Necessities Corp., General Necessities Bldg., Detroit, Mich.
Gibson Refrigerator Co., Greenville, Mich.
Gloekler Co., Bernard, 1627 Penn Ave., Pittsburgh, Pa.
Gurney Refrigerator Co., Fond du Lac, Wis.
Harder Refrigerator Corp., Cobleskill, N. Y.
Haskelite Mfg. Co., 120 S. La Salle, Chicago, Ill. (Knockdown.)
Heintz Mfg. Co., Front & Olney Aves., Philadelphia, Pa.
Heinz & Munschauer, Superior and Randall, Buffalo, N. Y.
Herrick Refrigerator Co., 1805 River, Waterloo, Iowa.
Hibbard Cabinets, Inc., 6504 Euclid Ave., Cleveland, O
Hill & Co., C. Y., 360 Pennington Ave., Trenton, N. J.
Holderle Bros., Inc., 339 Exchange, Rochester, N. Y.
Howe Scale Co., Rutland, Vt.
Jewett Refrigerator Co., Buffalo, N. Y.
Kingston. See Lorillard Refrigerator Co.
Kleen Kold. See Harder Refrigerator Corp.
Knox Products Co., Fourth & Greenhill Ave., Wilmington, Del.
Knox. See Erie Art Metal Co.
Leonard Refrigerator Co., Div. of Electric Refrigeration Corp., Grand Rapids, Mich.
Liver & Co., C. B., Omaha, Neb.
Loeber Co., Henry G., 151 E. 126th, New York, N. Y. (Ice Cream Cabinet.)
Lorillard Refrigerator Co., 44 Cooper Square, New York.
Louisville Refrigerator Corp., 4460 Louisville Ave., Louisville, Ky.
Louisville Tin & Stove Co., Louisville, Ky.

Gage List of
Electrical Buyers
The Trade Authority

Mace & Co., L. H., 55 E. 150th, New York, N. Y.
Maine Mfg. Co., Nashua, N. H.
McCray Refrigerator Sales Corp., 2364 Lake St., Kendallville, Ind.
Mowatt Refrigerator Co., 25 Oak Grove, San Francisco, Ca.
Omaha Fixture & Supply Co., 11th and Douglas, Omaha.
Oreole. See Ottenheimer Bros.
Ottenheimer Bros., Baltimore, Md.
Plymetl. See Haskelite Mfg. Co.
Reol. See Ottenheimer Bros.
Reolite. See Ottenheimer Bros.
Rex Mfg. Co., Connersville, Ind.
Rexdale. See Rex Mfg. Co.
Rhinelander Refrigerator Co., Rhinelander, Wis.
Sanitary Refrigerator Co., Fond du Lac, Wis.
Schmidt Co., C., John and Livingston, Cincinnati, O
Seeger Refrigerator Co., St. Paul, Minn.
Sherer-Gillett Co., 601 W. Washington, Chicago, Ill.
Steeprest. See Heintz Mfg. Co.
Success Mfg. Co., Gloucester, Mass.
Tennessee Furniture Co., Chattanooga, Tenn.
Vogt. See General Necessities Corp.
Ward Refrigerator Co., 6901 S. Alameda, Los Angeles, Cal.
White Mountain. See Maine Mfg. Co.
White Seal. See Louisville Refrigerator Co.

REFRIGERATOR CONDENSER UNITS. See Condenser Units, Refrigerator.

REFRIGERATOR FITTINGS

Commonwealth Brass Corp., 5781 Commonwealth Ave., Detroit, Mich.

REGULATORS, Temperature

American Radiator Co., 1807 Elmwood Ave., Buffalo, N. Y. (Mercury Switch Type.)
American Telethern Co., 1017 Summit, Toledo, O.
American Thermostat Co., 226 Jelliff Ave., Newark, N. J.
Automatic Electric Heater Co., 1706 Race, Philadelphia, Pa. (Furnace.)
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Basel Mfg. Co., 911 Mulberry, Kansas City, Mo.
Boston Machine Wks. Co., 7 Willow, Lynn, Mass.
Brown. See Electric Automatic Appliance Co.
Brown Instrument Co., Wayne & Windrim, Philadelphia.
Cease. See Cobb Electric Appliance Co.
Cobb Electric Appliance Co., 100 Massachusetts Ave., Boston.
Cook Elec. Co., 2700 Southport Ave., Chicago, Ill.
Davis & Daggett Co., 238 Dwight, Springfield, Mass.
D. & T. Manufacturing Co., 3001 La Salle, St. Louis, Mo.
Electric Automatic Appliance Co., Denver, Col.
Engelhart, Chas., 90 Chestnut, Newark, N. J.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Gifford Heat Control Systems, 1 Broadway, New York.
Gold Car Htg. & Ltg. Co., 220 36th, Brooklyn, N. Y.
Hart Mfg. Co., Hartford, Conn.
Hermansen Elecl. Co., 505 W. 41st, New York, N. Y.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Jewell Mfg. Co., Auburn, N. Y.
Johnson Service Co., 149 Michigan, Milwaukee, Wis.
Lockswitch. See Time-O-Stat Controls Co.
Majestic Electric Appliance Co., San Francisco, Cal.
Marvel. See American Thermostat Co.
Mercoid Corp., 564 W. Adams, Chicago, Ill. (Mercury Switch.)
Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave., Minneapolis, Minn.
Penn Heat Control Corp., 1207 Race, Philadelphia, Pa.
Powers Regulator Co., 2720 Greenview Ave., Chicago, Ill.
Protectostat. See Minneapolis-Honeywell Reflector Regulator Co.
Ranco. See Automatic Reclosing Circuit Breaker Co.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
Simplex Heat Regulator, 2938 Pillsbury Ave., Minneapolis.
Snapon. See Tagliabue Mfg. Co.
Souder-Hornsby Co., Tamaqua, Pa.
Sure Fire. See Boston Machine Wks.
Tagliabue Mfg. Co., C. J., 18 33rd, Brooklyn, N. Y.
Time-O-Stat Controls Co., Cramblet Engineering Div., 286 Milwaukee Ave., Milwaukee, Wis.
Trent Co., Harold E., 439 N. 12th, Philadelphia, Pa.
Webster Elec. Co., Racine, Wis.
Wilcolator Co., Newark, N. J.
Wilson-Maeulin Co., 383 Concord Ave., New York, N. Y.

REGULATORS, Voltage

Ward-Leonard Electric Co., Mount Vernon, N. Y.
Rotor. See Ward-Leonard Electric Co.

RELAYS

(See also Circuit Breakers and Thermostats.)
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Duneo. See Struthers Dunn, Inc.
General Electric Co., Schenectady, N. Y.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Signal Engineering & Mfg. Co., 148 W. 14th, New York
Struthers Dunn, Inc., 1135 Race, Philadelphia, Pa.
Wilcolator Co., Newark, N. J.

REMOTE CONTROL SWITCHES. See Switches, Remote Control.

REMOVERS, Coil

Ewing Mfg. Company, Middleport, Ohio.

RESISTANCE

Boxes. See Instruments, Laboratory Standard
Coil Cores. See Cores, Resistance.
Test Sets. See Instruments.
Units, Radio. See Radio Circuit Components.
Units. See Units, Rods & Grids.
Wire. See Wire Bare.

RESISTORS

Lautz Mfg. Co., 245 N. J. R.R. Ave., Newark, N. J.
Ohmite Mfg. Co., 636 N. Albany Ave., Chicago, Ill.

RESISTORS. See Units, Rods & Grids.

RESURFACERS, Commutator. See Stones, Commutator, also Tools, Commutator Truing.

REVOLUTION COUNTERS. See Tachometers.

RHEOSTATS,
Motor-Controlling. See Controllers, also Rheostats.
Radio. See Radio Receiver Parts.
Sewing Machine. See Controllers.

RHEOSTATS

	KEY
Battery Charging	See B
Stage Dimming	See D
Meter Testing (Laboratory)	See L
Plating Tank	See P
Motion Pictures (Projector Lamp)	See M
Motor Starting, Field and Speed Regulating	See F

F B D P M

Allen-Bradley Co., 494 Reed, Milwaukee
Biddle, James G., 1211 Arch, Philadelphia
Brach Mfg. Corp., L. S., Newark, N. J. (Radio Battery Control.) B
Bradleystat. See Allen-Bradley Co.
Columbia Electric Mfg. Co., 1292 E. 52nd, Cleveland, O. P
Controlite. See Ward Leonard Elec. Co.

REYNOLDS BAKELITE

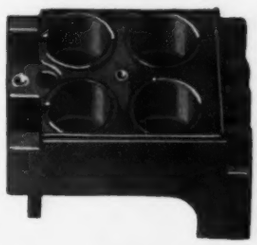
Bakelite Components of a Switch Panel
Molded by Reynolds Spring Co. for Square D Co.

The reason leaders in industry come to us for moldings of Bakelite is that the years of experience, the non-changeable policy to mold only to the 'nth degree of accuracy and then to ship the complete job when promised.

Another reason these leaders have come to Reynolds Spring Co.—we have yet to fail in the solution of any problem involving molding in Bakelite. At the service of electrical manufacturers is an engineering department that functions 100% in cooperation.

So, why ponder over the problem—put it up to us for an accurate, economical solution.

We anticipate sketches or blue prints outlining your problems—send them along and we'll solve them.



REYNOLDS SPRING CO., Jackson, Mich.

Screw Machine Products

UP TO 2¼ in. DIAMETER

OLSON MFG. CO.

56 Commerical St.

WORCESTER, MASS.

RHEOSTATS—Continued

Crown Rheostat & Supply Co., 1908 Maypole Ave., West Chicago, Ill. ..... P
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis. ..... F B D . . . L
Economic Rheostat Switch Co., 3551 N. 5th, Philadelphia, Pa. ..... F
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland, O. ..... F
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O. ..... B
General Electric Co., Schenectady, N. Y. F L
Hanson-Van Winkle-Munning Co., Matawan, N. J. ..... P
Holzmuller, C. J., 1108 Howard, San Francisco, Cal. ..... D
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y. . . D . . M . .
Knoeller Elec. Co., De Pere, Wis. ..... F
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago ..... F B D . . M L
Optimus. See Hanson-Van Winkle-Munning Co.
Robertson, Leo F., 536 W. 22nd, New York, N. Y. ..... M
Rubicon Co., 29 W. Sixth, Philadelphia, Pa. L
Schaefer Bros. Co., 1059 W. 11th, Chicago . . B . . . . .
Simplicity. See Cutler-Hammer Mfg. Co.
Union Elec. Mfg. Co., 934 Juneau Ave., Milwaukee, Wis. ..... F
Universal. See Ward Leonard Elec. Co.
Vitrohm. See Ward Leonard Elec. Co.
Ward Leonard Elec. Co., 31 South, Mt. Vernon, N. Y. ..... F . . D . . M . .
Watton. See Electric Products Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. ..... F . . . . . M .

RINGS Seal. See Packing.

RIVETS

Chase Brass & Copper Co., Waterbury, Conn.
Chicago Rivet & Specialty Co., 1830 S. 54th, Chicago, Ill
Hassall, Inc., John, 402 Oakland, Brooklyn, N. Y.
Hungerford Brass & Copper Co., Div. of The Chase Brass Companies, Inc., 88 Lafayette, New York, N. Y.
Manufacturers Belt Hook Co., 1315 W. Congress, Chicago, Ill.
Nelson Rivet Co., Taunton, Mass.
Stimpson Co., Edwin B., 70 Franklin Ave., Brooklyn, N. Y
Thomson Mfg. Co., Judson L., Waltham, Mass.
Tubular Rivet & Stud Co., 87 Lincoln, Boston, Mass.
Waterbury Brass Goods Co., Waterbury, Conn.
Wright & Corson Mfg. Co., Bridgeport, Conn.

RODS, Resistance. See Units, Rods and Grids.
ROLLER BEARINGS. See Bearings, Ball and Roller.

ROLLS, Coil Flattening

Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.

RUBBER BELTS. See Belts, Rubber.

RUBBER, Hard

Hard Rubber, Ebonite, Vulcanite.
Aetna Rubber Co., 815 E. 79th, Cleveland, O.
American Hard Rubber Co., 11 Mercer, New York, N Y.
Connecticut Hard Rubber Co., West Haven, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Luzerne Rubber Co., Muirhead, near Dewey, Trenton, N. J.
Mahoganite. See American Hard Rubber Co.
New York Hard Rubber Turning Co., 212 Centre, New York.
Panelyte Corp., Trenton, N. J.
Radiolite. See Superior Hard Rubber Co.
Stokes Rubber Co., Trenton, N. J.
Superior Hard Rubber Co., Butler, N. J.
United States Rubber Co., 1790 Broadway, New York, N. Y.
Vulcanized Rubber Co., 251 4th Ave., New York, N. Y
Vulco Panels. See Vulcanized Rubber Co.

RUBBER, MECHANICAL GOODS

Goodrich Rubber Co., B. F., Akron, O.
Manhattan Rubber Mfg. Co., Passaic, N. J.
Republic Rubber Co., Youngstown, O.
Sun Rubber Co., Barberton, O.

RUBBER, SEMI-HARD. See Rubber Mechanical Goods.

RUBBER, Sponge

Sun Rubber Co., Barberton, O.
Toycraft Rubber Co., Ashland, O.

RUBBER TAPE. See Tape, Rubber and Friction.
RUBBER TUBING. See Tubing, Rubber.
RUST PROOFING. See Plating & Finishing.
SAL AMMONIAC. See Chemicals, Battery.
SALTS, Battery. See Chemicals, Battery.
SATURATING TANKS. See Wire Manufacturing Machines
SCREW SHELLS, Socket. See Shells, Screw Socket.

SCREW DRIVING MACHINES

Vim Electric Tool Co., 149 Broadway, New York, N. Y.

SCREW MACHINE PRODUCTS

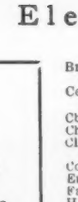
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh, Pa.
American Metal Wks., 4805 Stanton Ave., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Blake & Johnson Co., Waterbury, Conn.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.

SCREW MACHINE PRODUCTS AND SPRINGS

for every purpose

WILLIAM STEINEN & COMPANY

297 Washington St. Newark, N. J.



Brighton Screw & Mfg. Co., 1456 Harrison Ave., Cincinnati, O.
Celoron Co., Div. of Continental-Diamond Fibre Co., Bridgeport, Pa.
Chapman Machine Co., Terryville, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Clark Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Colonial-Premier Co., 225 W. Ohio, Chicago, Ill.
Eureka Tool & Machine Co., Newark, N. J.
Faries Mfg. Co., Decatur, Ill.
Hanson, Einar R., 17 Hermon, Worcester, Mass.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Indianapolis Screw Products Co., 621 N. Noble, Indianapolis,
Interstate Products Corp., 29 Commercial, Newark, N. J.
Linden & Co., 891 Broad, Providence, R. I.
Meisel Press Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Olsen Mfg. Co., 56 Commercial, Worcester, Mass.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Shimer & Sons, Samuel J., Milton, Pa.
Steinen & Co., 297 Washington, Newark, N. J.
Thomaston Mfg. Co., Thomaston, Conn.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Wilmington Fibre Specialty Co., Wilmington, Del.

SCREWS, Cap (Cut Thread)

Bristol Co., Waterbury, Conn.
Hartford Machine Screw Co., Hartford, Conn.

SCREWS, Drive

Parker-Kalon Corp., 190 Varick, New York, N. Y.

SCREWS, Machine

Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Clark Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Elco Tool & Screw Corp., Rockford, Ill.
Hubbell, Inc., Harvey, Bridgeport, Conn.
New England Screw Co., Dept. A, 44 Farnsworth, Boston.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Strong, Carlisle & Hammond, 1392 W. Third, Cleveland, O.

SCREWS, Machine (Cut Thread)

American Screw Co., Providence, R. I.

SECOHMMETERS. See Instruments, Laboratory Standard.
SEGMENTS. See Discs, Armature.

SEPARATORS, Storage Battery

Baltimore Battery Separator Co., Baltimore, Md.
Campbell Elec. Co., Kansas City, Mo.
Carlile & Doughty, 2530 N. Broad, Philadelphia, Pa.
Chattanooga Battery Box Co., Chattanooga, Tenn.
Certified. See Ermet Products Co.
Ermet Products Co., Sherman Drive & 16th, Indianapolis, Ind. (Wood.)
Estes & Sons, E. B., 25 Vanderbilt Ave., New York. (Wood.)
Indianapolis Box & Separator Co., 1450 E. 19th St., Indianapolis, Ind. (Wood.)
Indianapolis Mfg. Co., Indianapolis, Ind.
Inseco. See Indianapolis Box & Separator Co.
Link & Hemrick, Inc., 555 W. 52nd, New York, N. Y.
Red Band. See Indianapolis Mfg. Co.
Stewart Mfg. Co., Wm. E., 14th & Elm, Flint, Mich. (Wood.)
Wick Lumber Co., R., 539 W. 52nd, New York. (Wood.)

SHADES

Aluminum. See Shades, Metallic.
Asbestos. See Shades, Fabric.
Bamboo. See Shades, Fabric.
Brass. See Shades, Metallic.
Cast Metal. See Shades and Domes.
Copper. See Shades Metallic.
Cretonne. See Shades, Fabric.
Leaded. See Shades and Domes.
Leather. See Shades, Fabric.
Linen. See Shades, Fabric.
Mica. See Shades, Mica.
Molded. See Molded Insulation.
Mosaic. See Shades and Domes.
Paper. See Shades, Fabric.
Parchment. See Shades, Fabric.
Silk. See Shades, Fabric.
Stamped Metal. See Shades, Metallic; also Shades and Domes.
Steel. See Shades, Metallic.
Tin. See Shades, Metallic.
Zinc. See Shades, Metallic.

SHADES, Fabric

Asbestos Cretonne, Leather, Linen, Paper, Silk, Bamboo, Parchment.
Acme Lamp Shade Co., 630 West Jackson Blvd., Chicago. (Silk.)
Adelphi Lamp Shade Co., 242 Fifth Ave., New York. (Silk.)
Admiration Lamp Shade Co., 160 Madison Ave., New York, N. Y. (Silk.)
Andrews Co., C. M., 32 E. 30th, New York, N. Y. (Silk.)
Art Lamp Shade Studios, 316 Fifth Ave., New York, N. Y.
Audrey Art Shade Studios, 105 Thatford Ave., Brooklyn.
Block & Co., L. D., 37 E. 18th St., New York, N. Y.
Borghese. See Hall, Chas.
Daizer Co., Charles Y., 76 Essex, Boston, Mass. (Silk.)
Eastern Art Shop, 14 W. 19th, New York. (Parchment.)
Foss Parchment Shade Studio, 1338 E. 12th, Oakland, Cal. (Parchment.)
Foslite. See Foss Parchment Shade Studio.
Frostelene. See Art Lamp Shade Studios.
Gibson Art Co., 223 W. Fourth, Cincinnati, Ohio. (Paper.)
Hall, Chas., 3 E. 40th, New York, N. Y. (Paper Parchment.)
Hanson Co., Paul, 15 E. 26th, New York, N. Y. (Chints.)
Harris Mfg. Co., 122 University Place, New York, N. Y. (Parchment.)
Herco Art Mfg. Co., Meriden, Conn.
Hoft Studio, 46 W. 21st, New York, N. Y. (Parchment.)
Idealite Elec. Lamp Shade Mfg. Co., 7 E. 17th, New York, N. Y. (Parchment.)
Kapa Shell. See Wardwell, E. H.
Kerwin. See Hall, Chas.
Kno-Glair. See Hamilton, M. E.
Lamb Bros. & Greene Corp., Napannee, Ind. (Silk.)
Luxrite. See John H. St. John.
Maxwell-Ray Co., Milwaukee, Wis. (Silk.)
Monarch Lamp & Shade Co., 210 N. Second, Philadelphia, Pa. (Silk.)
Morimura Bros., 58 W. 23rd, New York. (Bamboo, Silk, Cretonne.)
Parchment Novelty Co., 87 E. 10th, New York, N. Y. (Parchment.)
Patent Lamp Shade Co., 1361 Frankford Ave., Philadelphia.
Peerless Lamp Shade Mfg. Co., 114 E. 25th, N. Y. (Silk.)
R. D. Electric Co., Fort Wayne, Ind. (Linen and Silk.)
Reuter, Wm., 32 W. 34th, New York, N. Y. (Silk.)
Rindsberger Mfg. Corp., 18 E. 24th, Chicago, Ill.
Rosita Studio, 10 W. 28th, New York, N. Y. (Parchment and Leatherette.)

Spray Finishing Fundamentals

By Paul W. Collins

The second of a series of articles on the subject.

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Sanderson's Art Co., Milwaukee, Wis. (Parchment.)
Springel & Son, A., 26 S. 3rd, Philadelphia, Pa.
St. John, John H., 1298 Atlantic Ave., Brooklyn, N. Y. (Silk.)
Straus-Hohenstein Co., 133 W. 21st, New York. (Silk.)
Superior Lamp Shade Manufacturers, 72 Madison Ave., New York, N. Y. (Silk.)
Tombs Studios, Wm. H., 172 Pennsylvania Ave., Newark, N. J. (Parchment Paper.)
Trio Mfg. Co., 610 N. American, Philadelphia, Pa. (Silk.)
Troy Art Studio, 624 24 Ave., Troy, N. Y.
Utility Shade Co., Tenafly, N. J.
Vogue Lamp & Shade Co., 130 W. 17th, New York, N. Y. (Parchment.)
Volkman & Co., 3223 W. Lake, Chicago, Ill.
Wardwell, E. H., 11 E. 36th, New York, N. Y.

SHADES AND DOMES

Leaded, Mosaic or Figured, Stamped or Cast Metal.
Art Shade Co., 224 N. Desplaines, Chicago, Ill.
Badanes Mfg. Co., 62 Greene, New York, N. Y.
Bayley & Sons, 105 Vanderveer, Brooklyn, N. Y.
Mutual Sunset Lamp Co., 21 E. Houston, New York, N. Y.
Western Art Glass Shade Works, 101 Turk, San Francisco.

SHADES, FACTORY WINDOW. See Window Shades, Factory.

SHADES, Metallic

Tin, Aluminum, Brass, Copper, Zinc, Steel.
A. A. Elec. Mfg. Co., Bridgeport, Conn. (Sole selling agent, Harry Pickhardt, 129 W. 15th, New York, N. Y.)
Durez. See Wheeler Reflector Co.
Faries Mfg. Co., Decatur, Ill. (Brass, Aluminum, Tin, Copper.)
Frink Co., Inc., 369 Lexington Ave., New York, N. Y. (Aluminum, Brass, Zinc, Iron, Steel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Aluminum, Brass, Steel, Tin.)
Miller Co., Meriden, Conn.
Monk, H. E., 18 Warren, New York, N. Y. (Tin, Aluminum, Brass, Copper, Zinc & Steel).
Oamco. See Overbaugh & Ayres Mfg. Co.
Overbaugh & Ayres Mfg. Co., 411 S. Clinton, Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Western Reflector Co., 1221 W. Madison, Chicago. (Tin.)
Wheeler Reflector Co., 275 Congress, Boston, Mass.

SHADES, Mica

Hirsch Mica Co., 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
Kant-Krack. See Huse Liberty Mica Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Tarmilite. See Tar Heel Mica Co.

SHAFT COUPLINGS. See Couplings, Shaft.
SHAFTS, Flexible. See Tubing, Flexible Metallic.

SHAPING MACHINES, Coil

Munsdorf Company, W. P., 720 Frankfort, Cleveland, Ohio.

SHEARS, Insulation

Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.

SHEET STEEL CABINETS. See Cabinets, Sheet Steel.

SHELLS, Screw Socket

Chase Brass & Copper Co., Waterbury, Conn.
Dallas Brass & Copper Co., 820 Orleans, Chicago, Ill.
Patton-MacGuyer Co., Providence, R. I.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Torrington Mfg. Co., 70 Franklin, Torrington, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., 800 S. Main, Waterbury, Conn. (Miniature.)

SHUNTS, Instruments. See Instruments, Laboratory Standard.
SIGN FLASHERS. See Flashers, Sign.
SIGN LETTER LENSES. See Lenses.

SILICA

Ottawa Silica Co., Ottawa, Ill. "Flint Shot."

SILK, Cloth Insulated. See Cloth & Paper.
Shades. See Shades, Fabric.
Tape. See Tape.
Thread. See Yarn, etc.

SILVER, Metal and Wire

Baker & Co., Inc., 54 Austin, Newark, N. J.
Gilby Wire Co., Riverside Ave., Newark, N. J.
Handy & Harman, 57 William, New York, N. Y.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., 97 Chestnut, Newark, N. J.

SILVER SOLDER. See Solder, Silver.
SINE WAVE OSCILLATORS. See Instruments, Laboratory Standard.
SIGN ELECTRODES, Gas. See Electrodes for Gas Signs.
SKINNERS WIRE. See Scrapers.
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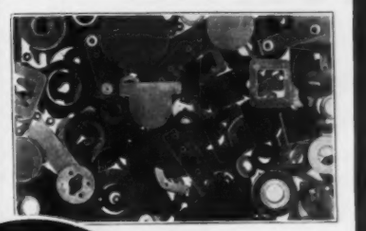

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Structural Slate Co., Pen Argyl, Pa.
SLEEVE-BEARINGS. See Bearings and Bushings.
SLEEVING, Cotton. See Tape, Cotton.
SLOTTING FILES. See Files. Commutator Slotting.

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General Electric Co., Schenectady, N. Y.
Hobart Bros. Co., Troy, Ohio.
Hullhorst Micro Tool Co., 3240 E. Monroe, Toledo, O.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Elec. Co.
Martindale Electric Co., 1262 W. Fourth, Cleveland, Ohio.
Oman, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ransom & Randolph Co., Superior & Chestnut, Toledo, Ohio.
Simplex. See Weidenhoff, Joseph.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.
White Dental Mfg. Co., S. S., 152 W. 42nd, New York.
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Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
SOCKET LININGS. See Linings, Socket
SOCKET SHELLS. See Shells, Screw Socket.
SOCKETS, Flashing. See Flashers, Sign.

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Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bryant Electric Co., Bridgeport, Conn.
Duplex. See Warner Bros. Co.
Eade, John E., 104 Point, Providence, R. I. Links, Insulators.
Easylite. See Rittenhouse Co., A. E.
Economy. See Harvey Hubbell, Inc.
Flory, Wm. E., 38 W. 32nd, New York, N. Y. (Decorative Pull Chains.)
Gripper. See Wittenberg Bros.
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Hubbell, Inc., Harvey, Bridgeport, Conn. (Links and Acorns. Metal Pull Tassels.)
Palste. See Hart & Hegeman Mfg. Co.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y. (Pull Chain Tassel.)
P. & S. See Pass & Seymour, Inc.
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Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Royal. See Sears, Henry D.
Scovil Mfg. Co., Waterbury, Conn. (Acorn.)
Sears, Henry D., 50 Boylston, Boston, Mass.
Weber. See Sears, Henry D.
Wittenberg Bros., 60 Shipman, Newark, N. J. Links. Insu-

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Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Can-del-lite. See Sears, Henry D.
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Electric Co., 94 Allyn, Hartford, Conn.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Hart & Hegaman Div. of Arrow-Hart & Hegeman Elec. Co. Hartford, Conn.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Propp Co., M., 524 Broadway, New York, N. Y.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sears, Henry D., 50 Boylston, Boston, Mass.
SOCKETS, Radio. See Radio Receiver Parts.

SOCKETS AND RECEPTACLES, Lamp

Bases other than Standard (or Medium) are indicated as follows: Mogul, M; Candelabra (or Miniature), C.

Key	See K
Composition	See W
Metal Shell	See B
Porcelain	See A
Pull Chain	See P
Push Through	See T
Sign Receptacles	See A

A. B. C. See Leviton Mfg. Co.
Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J..... A
Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo..... W
Alabax. See Arrow Elec. Co.
Appleton Electric Co., 1730 Wellington Ave., Chicago, Ill..... A
Armstrong & White, 9th and Liberty Ave., Pittsburgh, Pa..... A
Arrow Elec. Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. M C K T P B A
Arrogrip. See Arrow Elec. Co.
A. & W. See General Outdoor Adv. Co.
Beaver Mfg. Co., 625 N. Third, Newark, N. J..... C .... P B .
Best. See United States Elec. Mfg. Corp.
Bryant Elec. Co., Bridgeport..... M C K T P B A
C-H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J.... M .. K T P B A
Circle T. See Trumbull Elec. Mfg. Co.
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Crouse-Hinds Co., Syracuse, N. Y.... A W .....
Cutler-Hammer, Inc., 1287 St. Paul Ave., Milwaukee, Wis..... K T .. B A
Durez. See Wheeler Reflector Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y. .....
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill..... P B ..
Far-Go Elec. Mfg. Co., 368 Broome, New York, N. Y..... C .....
Federal Electric Co., 8700 S. State, Chicago, Ill. ..... A
Flute. See Pass & Seymour.
Fluteliet. See Pass & Seymour.
Frink Co., Inc., 369 Lexington Ave., New York, N. Y..... M C ..... B ..
Gaynor Elec. Co., Bridgeport, Conn.... .....
General Elec. Co., Merchandise Dept., Bridgeport, Conn. ..... M C K T P B A
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. ..... M C K T P B A
Hoosick Falls Radio & Elec'l Parts Mfg. Co., Hoosick Falls, N. Y.... W .....
Hubbell, Inc., Harvey, Bridgeport, Conn. M C K T P B A
H. & H. See Hart & Hegeman.
I-D-A. See Watson Mfg. Co., J. E.
K-E Cleat Receptacle. See Kirkman.
Kirkman Engineering Co., 1 Dominick, New York. (Cleat Receptacle.).... .....
Leader. See Leviton Mfg. Co.
Leiser & Co., W. A., 1607 Sansom, Philadelphia, Pa. ..... A
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y. ..... M C K .. P B A
Levroller. See McGill Mfg. Co.
Liberty Bell. See Hart & Hegeman.
Locat-A-Catch. See Connecticut.
McGill Mfg. Co., Valparaiso, Ind.... ..... P B A
Majestic Elec. Mfg. Co., 806 N. 12th, St. Louis. (Lamp Receptacle.)..... A
Molded Socket Corp., Railroad, Pa.... .... K .....
Multi Elec'l Mfg. Co., 1840 W. 14th, Chicago, Ill. ..... A
Multilok. See Circle F Mfg. Co.
Newgard. See Multi Elec'l Mfg. Co.
New Wrinkle. See Bryant Elec.
Noark. See Colt's Patent Fire Arms.
One 4 All. See Propp Co., M.
P. & S. See Pass & Seymour.
Pass & Seymour, Solvay Station, Syracuse, N. Y. ..... M C K T P B A
Paulding, John I., New Bedford, Mass. ..... B A
Perkins. See Bryant Elec. Co.
Porcelain Products, Inc., Findlay, O.... ..... A
Propp Co., M., 524 Broadway, New York, N. Y. .....
Quick Catch. See Hubbell, Inc.
Royal. See Sears, Henry D.
Ryan Appliance Co., 117 Mulberry, Trenton, N. J..... W ..... A
Safti Soc. See Molded Socket Corp.
Sears, Henry D., 50 Boylston, Boston M C K T P B A
Security. See Circle F Mfg. Co.
Shurlock. See Pass & Seymour.
Siemen Co., Bridgeport, Conn..... .....
Taplet Mfg. Co., 3709 Powelton Ave., Philadelphia, Pa. ..... A
Titan. See Bryant Elec. Co.
Trumbull Elec. Mfg. Co., Plainville, Conn. ..... A
Unilon Insul. Co., Parkersburg, W. Va. .....
United States Elec. Mfg. Corp., 222 W. 14th, New York, N. Y..... P .. B .. W
U. S. Electric Co., 311 Chambers St., Trenton, N. J. ..... A
Walco. See Leiser & Co., W. A.
Waterbury Button Co., Waterbury, Conn. .....
Watson Mfg. Co., J. E., 5506 N. Fifth, Philadelphia, Pa. (Concealed Fixture) ..... P B ..
Weber. See Sears, Henry D.
Wheeler Reflector Co., 275 Congress St., Boston, Mass..... P ....
Wiring Devices, Inc., 5 High, Trenton, N. J. ..... A
Wood Electric Co., C. D., 565 Broadway, New York. (Sign Receptacles.) ..... A
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Solderlume. See Aluminum Solder Corp. of America.
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Usarco. See Union Smelting & Refining Co.

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Genuine A. See Hoyt Metal Co.
Hoyt Metal Co., St. Louis, Mo.

SOLDER, Self-Fluxing

American Solder & Flux Co., 2910 N. 16th, Philadelphia.
Dutch-Boy. See National Lead Co.
Gardiner Metal Co., 1366 W. Lake, Chicago, Ill.
Kester Solder Co., 4210 Wrightwood Ave., Chicago, Ill.
Lenk Mfg. Co., 32 Merrimac, Boston, Mass.
National Lead Co., 111 Broadway, New York, N. Y.
Silva-Wares, Inc., 134 W. 26th St., New York, N. Y.
Solderall Co., 129 Sussex Ave., Newark, N. J.
Tinol. See American Solder & Flux Co.

SOLDER, Silver

Handy & Harman, 57 William, New York, N. Y.
Wilson Co., H. A., Newark, N. J.
SOLENOIDS. See Coils, Finished.

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Compounds. See Soldering Compounds.
Irons. See Soldering Irons.
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Amco. See American Solder & Flux Co.
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Callahan & Co., Geo., 218 Front, New York. (Fluid.)
Central Stamping Co., 206 Broadway, New York, N. Y. Paste and Salts.
Challenge. See Highland Electro Chemical Co.
Conductaluts. See Technical Products Co.
Crescent. See McGill Mfg. Co.
Diamond. See Burnley Battery & Mfg. Co.
Dielectric Mfg. Co., St. Louis, Mo.
Dunton Co., M. W., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Eureka. See Grasselli Chemical Co.
Firth Radio Corp., 25 Beaver, New York, N. Y.
Fluxite. See Monarch Products Co.
Garden City Laboratory, 300 W. Adams, Chicago, Ill.
General Elec. Co., Merchandise Dept., Bridgeport, Conn. (Paste).
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Highland Electro Chemical Mfg. Co., Connellsville, Pa. (Paste, Stick, Salts.)
Incomparable. See Reade Mfg. Co.
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Lukens Metal Co., T. F., 1105 Fairmount Ave., Philadelphia, Pa.
McGill Mfg. Co., Valparaiso, Ind. Fluid.
Mitchell-Rand Mfg. Co., 19 Vesey, New York. (Paste.)
Monarch Products Co., Red Bank, N. J.
Neutral. See Dielectric Mfg. Co.
New-Idea. See Hartwig Co., Wm. J.
Nokorode. See Dunton Co., M. W.
Oakwood. See Weaver Specialty Co.
Paragon Insulating Co., 5716 Euclid Ave., Cleveland, O.
Perfecto. See Firth Radio Corp.
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Queens. See Brunner Chemical Works.
Reade Mfg. Co., 133 Hoboken Ave., Jersey City, N. J. (Fluids, Salts, Paste).
Redens. See Reade Mfg. Co.
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Rodale Mfg. Co., 200 Hudson, New York, N. Y. (Paste.)
Rotax Mfg. Co., 380 E. 133rd, New York, N. Y.
Ruby Chemical Co., Columbus, O.
Ruby Fluid. See Ruby Chemical Co.
Salbrick. See American Solder & Flux Co.
Snarr & Co., Geo. W., 110 S. Ninth, St. Louis, Mo. (Paste.)
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Speco. See Pfanstiehl Chemical Co.
Standard. See Grasselli Chemical Co.
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Technical Products Co., 114 S. Sheridan Sq., Pittsburgh, Pa. (Paste.)
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B-D. See Bleadon-Dun Co.
Beardsley & Wolcott Mfg. Co., Waterbury, Conn.
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Betsy Ross. See Central Flatiron Mfg. Co.
Bleadon-Dun Co., 2300 Warren Ave., Chicago, Ill.
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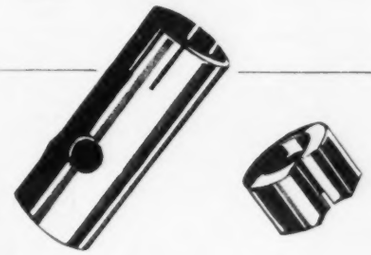

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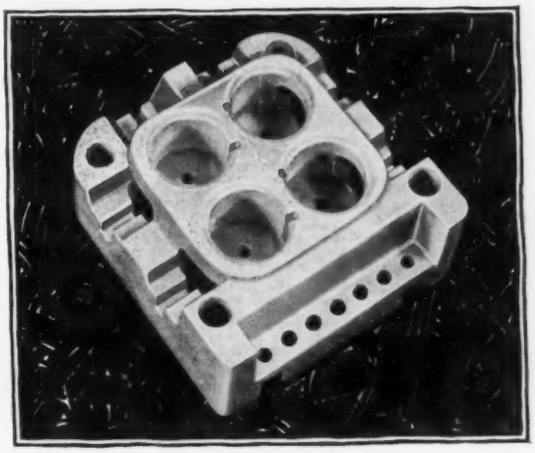

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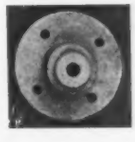

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Electrahot Mfg. Co., 525 S. 4th, Minneapolis, Minn.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland. (Transformer Soldering Outfit.)
Electric Soldering Iron Co., Inc., 135 W. 17th, New York.
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Esico. See Electric Soldering Iron Co.
Everhot. See Swartzbaugh Mfg. Co.
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General Electric Co., Schenectady, N. Y.
Gold Seal Elecl. Co. of Ohio, Inc., 250 Park Ave., New York, N. Y.
Home. See Majestic Elec. Appliance Co.
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Industrial. See Permway Mfg. Co.
Jiffy. See Koch & Co., Paul W.
Junior. See Drake Elec. Wks.
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Lotan. See Simplex Flux & Solder Co. of America.
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Red Bird. See Security Electric Mfg. Co.
regular. See National Specialties Co.
Reliance. See Landers, Frary & Clark.
Samson Cutlery Co., 8 Jones St., Rochester, N. Y.
Security Elec. Mfg. Co., 2635 Canton, Chicago, Ill.
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Simplex Flux & Solder Co. of America, 1965 E. 66th, Cleveland, O.
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Vulcan Elec. Heating Co., 225 Varick, New York, N. Y.
Waage Elec. Co., 5100 W. Ravenswood Ave., Chicago, Ill.
Ward Mfg. Co., 937 Wellington Ave., Chicago, Ill.
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SPAGHETTI. See Tubing, Varnished Fabric.
SPEED CHANGING UNITS. See Gears (Speed Changing Units).
SPEED INDICATORS. See Tachometers.
SPOOLING MACHINES, WIRE. See Wire Manufacturing Machines.

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Babco. See Simons Paint Spray Brush Co.
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Koch Bros. Mfg. Co., 2339 Nelson, Chicago, Ill.
K B. See Koch Bros. Mfg. Co.
Metal Specialties Mfg. Co., 338 N. Kedzie Ave., Chicago.
Macleod Co., 2232 Bogen, Cincinnati, O.
Paasche Air Brush Co., 1909 Diversey Parkway, Chicago, Ill.
Pioneer Air Compressor Co., 243 Canal, New York, N. Y.
Presto. See Metal Specialties Mfg. Co.
Simons Paint Spray Brush Co., 17 Maryland Ave., Dayton, O.
Simplex Spray Equipment Co., 552 W. Lake, Chicago, Ill
Spray-All. See United States Air Compressor Co., 5300 Harvard Ave., Cleveland, Ohio.
Sprayit. See Electric Sprayit Co.
United States Air Compressor Co., 5300 Howard Ave., Cleveland, O.
Wold Air Brush Mfg. Co., 2173 N. California Ave., Chicago, Ill.

SPREADERS, COIL & LOOP. See Winding Machines, Armature & Field Coil.

SPRING MAKING MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

SPRINGS,
Advance Spring & Wire Co., Carroll Ave. & Wood St., Chicago.
Barnes-Gibson-Raymond, Inc., 6400 Miller Ave., Detroit, Mich.
Cary Spring Works, Inc., 240 W. 29th St., New York, N. Y.
Chapin Co., Chas. E., 227 Fulton, New York, N. Y.
Cleveland Wire Spring Co., Cleveland, O.
Cook Spring Co., Ann Arbor, Mich.
Cuyahoga Spring Co., Berea Rd., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Eureka Tinware Mfg. Co., 135 W. 20th, New York, N. Y.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Gibson Co., Wm. D., 1800 Clybourn Ave., Chicago, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Lee Spring Co., 34 Main, Brooklyn, N. Y.
Miller & Van Winkle, Inc., 18 Bridge, Brooklyn, N. Y.
Hunter Pressed Steel Co., Landsdale, Pa.
Newcomb Spring Corp., 224 40th, Brooklyn, N. Y.
Peck Spring Co., Plainville, Conn.
Peterson Spring Co., 1660 Beard Ave., Detroit, Mich.
Rapid Spring Co., 222 Second Ave., Pittsburgh, Pa.

SPRINGS
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HUNTER PRESSED STEEL CO.
Lansdale, Pa.

Raymond Mfg. Co., Corry, Pa.
Standard Spring and Manufacturing Co., 236-41nd St., Brooklyn, N. Y.
Steinen & Co., 297 Washington, Newark, N. J.
Wallace Barnes Co., Bristol, Conn.
Young Industries, Inc., L. A., Detroit, Mich.

STAMPED BOXES. See Cabinets, Sheet Steel.
STAMPINGS, Fibre. See Fibre.
Sheet Metal. See Fixture Fittings.
Sheet Steel. See Stampings, Sheet Steel.
Small. See Stampings, Small.

STAMPINGS, Sheet Steel
Heavy Stamping and Drawing.
Acklin Stamping Co., 1925 Nebraska, Toledo, O.
American Stamping Co., 978 E. 64th, Cleveland, O.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Bossert Corp., Utica, N. Y.
Eureka Tinware Mfg. Co., 135 W. 20th, New York, N. Y.
Faries Mfg. Co., Decatur, Ill.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Geuder, Paeschke & Frey, St. Paul & 15th, Milwaukee.
Hubbard & Co., Pittsburgh, Pa.
Janney, Steinmetz & Co., 1421 Chestnut St., Philadelphia.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn.
Mullins Mfg. Corp., Washing Machine Division, Salem, Ohio. (Vitreous Enameled)
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind,
Truscon Steel Co., Youngstown, O.
United States Stamping Co., Moundsville, W. Va.

STAMPINGS, Small
Small Stamped Metal Parts for Electrical Devices.
Advance Tool & Die Casting Co., 1654 Holton, Milwaukee.
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
American Radio Hardware Co., 135 Grand, New York, N. Y.
American Stamping Co., 978 E. 64th, Cleveland, O.
Arrow Automatic Products Corp., 37 Vestry, New York, N. Y.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Bull Dog Electric Products Co., Detroit, Mich.
Chase Brass & Copper Co., Waterbury, Conn.
Clarke Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Elco Tool & Screw Corp., Rockford, Ill.
Eureka Tool & Machine Co., Newark, N. J.
Faries Mfg. Co., Decatur, Ill.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Geuder, Paeschke & Frey, St. Paul & 15th, Milwaukee.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Gray Bros. Co., Piano, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Krischer's Mfg. Co., 255 Calyer, Brooklyn, N. Y.
Lansing Stamping Co., Lansing, Mich.
Lenz Metal Stamping Wks., J., 199 Franklin, New York.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Mechanics Tool & Stamping Co., 7 Summer, Worcester, Mass.
Mutual. See Bull Dog Elec. Products Co.
Patton-MacGuyer Co., Providence, R. I.
Paul & Beekman Mfg. Co., 1734 N. Fifth, Philadelphia, Pa.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Precision Metal Workers, 3100 Carroll Ave., Chicago, Ill.
Premax Products, Inc., Niagara Falls, N. Y.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Signal Elec. Mfg. Co., Menominee, Mich.
Soss Mfg. Co., Roselle, N. J.
Steinen & Co., 297 Washington, Newark, N. J.
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.
United Stamping & Mfg. Co., Cleveland, Ohio.
United States Stamping Co., Moundsville, W. Va.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Waterbury Metal Wares Co., Waterbury, Conn.
Zierick Machine Wks., F. R., 68 E. 131st St., New York, N. Y.

STANDS, Armature
Columbia Machine Works & Malleable Iron Co., Atlantis Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17 & Cambria Sts., Philadelphia, Pa
Oman, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

STARTERS, Motor. See Controllers, Motor; Switches, Remote Control; Switches, Knife; Safety; Switches, Snap (Heavy Duty).
STEATITE. See Cores, Resistance Coil.
STEEL CASTINGS. See Castings, Steel.

STEEL for Electric Appliances
Elyria Iron & Steel Co., Elyria, O.
Ryerson & Son, Jos., 2558 W. 16th, Chicago, Ill.

STEEL, Magnet
Ajax Electrothermic Corp., Trenton, N. J.
Hercules Elec. Steel Corp., 145 Lafayette St., New York.
Indiana Steel Products Co., 4545 S. Western Ave., Chicago.
Indium Steel Co., Wurtlet, N. Y.
Reed Co., Jr., David, 85 Adams, Brooklyn, N. Y.
Swedmag. See Reid Co., Jr., David.

STEEL SHEETS
Agathon. See Central Alloy Steel Corp.
Allegheny Steel Co., Brackenridge, Pa.
American Rolling Mill Co., Middleton, Ohio.
American Sheet & Tin Plate Co., Frick Bldg., Pittsburgh.
Armco. See American Rolling Mill Co.
Armelec. See Empire Steel Corp.
Central Alloy Steel Corp., Massillon, O.
Cyclops Steel Co., Titusville, Pa.
Dynelec. See Empire Steel Corp.
Empire Steel Corp., Mansfield, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Manelec. See Empire Steel Corp.
Metelec. See Empire Steel Corp.
Newport Rolling Mill Co., Newport, Ky.
Polelec. See Empire Steel Corp.
Republic Iron & Steel Co., 335 Market, Youngstown, O.
Tranelec. See Empire Steel Corp.
Unilov. See Universal Steel Co.
Universal Steel Co., Bridgeville, Pa.
Wheeling Steel Corp., Wheeling, W. Va.

STEEL, STRIP. See Strip Steel.

STOCKS, Dies and Reamers
Hall-Will, Inc., Erie, Pa.
Red-E-Hall. See Hall-Will, Inc.
Toledo Pipe Threading Machine Co., 1445 Summit, Toledo, O

STONES, Commutator
Acme. See Green Equipment Corp.
Caro. See Electric Service Supplies Co.
Cleveland Stone Co., Union Trust Bldg., Cleveland, O.

Co-operative Utilities Co., 1503 Columbia Ave., Philadelphia, Pa.
Diamond Dee. See Co-operative Utilities Co.
Electric Service Supplies Co., 17th and Cambria, Philadelphia, Pa.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Electric Co.
Lombard & Co., Somerville, Mass.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.

STOOLS, Factory; Steel
Angle Steel Stool Co., Plainwell, Mich.
Chicago Wire Chair Co., 613 N. La Salle, Chicago, Ill.
Royal Metal Mfg. Co., 1130 South Michigan Ave., Chicago.

STORAGE
Battery Plates. See Plates, Storage Battery.
Battery, Separators. See Separaters.
Tools. See Tools, Storage Battery.

STRAINING MACHINES, INSULATION. See Wire Manufacturing Machines.

STRAIGHTENERS, Armature Shaft
Columbia Machine Works & Malleable Iron Co., Atlantis Ave. and Chestnut St., Brooklyn, N. Y.

STRANDING MACHINES. See Wire Manufacturing Machines.

STRIP STEEL
(Hot and Cold Roll).
Acme Steel Co., 2840 Archer Ave., Chicago, Ill. (Hot & Cold).
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. (Cold).
American Tube & Stamping Plant (Stanley Wks.) Bridgeport, Conn. (Hot & Cold.)
Athenia Steel Co., 135 William, New York, N. Y. (Cold.)
Barnes Co., Wallace, Bristol, Conn. (Hot.)
Central Alloy Steel Corp., Massillon, O. (Hot.)
Griffin Mfg. Co., Huron & Cherry, Erie, Pa. (Cold.)
Laclede Steel Co., 8th & Olive Sts., St. Louis, Mo. (Hot.)
Latrobe Electric Steel Co., Latrobe, Pa. (Hot & Cold.)
Republic Iron & Steel Co., 335 Market, Youngstown, O.
Sharon Steel Hoop Co., Sharon, Pa. (Hot.)
Stanley Wks., New Britain, Conn. (Hot & Cold.)
Steel and Tubes, Inc., Cleveland, O. (Hot & Cold.)
Superior Steel Corp., Union Trust Bldg., Pittsburgh, Pa. (Hot & Cold.)
Thomas Steel Co., Warren, Ohio.
West Leechburg Steel Co., Farmers Bank Bldg., Pittsburgh, Pa. (Hot & Cold.)

STRIPPERS, Wire
Acme. See A. Laubscher.
Artos Engineering Co., 115 Brown, Milwaukee, Wis. (Cutting, Stripping and Measuring).
Austin Co., M. B., 108 S. Desplaines, Chicago, Ill.
Colonial-Premier Co., 229 W. Ohio, Chicago, Ill.
Dicke Tool Co., Downers Grove, Ill.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
E-Z. See Pyramid Products Co.
F. F. See France Mfg. Co.
France Mfg. Co., 10325 Berea Rd., Cleveland. (Motor Driven.)
Goehst. See Klein & Sons.
Hartman. See Service Sales & Mfg. Co.
Ideal Commutator Dresser Co., 1008 Park Ave., Sycamore, Ill
Ives Mfg. Co., Meriden, Conn.
Klein & Sons, Mathias, Chicago, Ill.
Laubscher, A., 77 Fort Pleasant Ave., Springfield, Mass.
Perfection. See Weber Machine Corp.
Pyramid Products Co., 2311 S. State, Chicago, Ill.
Service Sales & Mfg. Co., 17005 Melgrave Ave., Cleveland, Ohio.
Speedcraft. See Wire Stripper Co.
Thomas Steel Products Co., Warren, Ohio.
Weber Machine Corp., 33 S. Water, Rochester, N. Y.
Wire Stripper Co., 507 Erie Bldg., Cleveland, O.
Zierick Machine Wks., F. R., 6 Howard, New York City. (Motor Driven Stripper & Twistor).

SWITCHBOARD INSTRUMENTS. See Instruments, Portable and Switchboard.
SWITCHBOARD OPALS. See Lenses.
SWITCHBOARDS, SLABS AND BARRIERS
See Asbestos Slabs; Molded Insulation; Slate; Soapstone.

SWITCH (switches)
Arms. See Posts, Binding.
"Across the Line" Type. See Controllers, Motor.
Baby Knife. See Switches, Battery.
Battery. See Switches, Battery.
Canopy. See Switches, Snap.
Clock Operated. See Switches, Time.
Feed Through. See Switches, Snap.
Fixture. See Switches, Snap.
Float. See Switches, Tank.
Flush. See Switches, Snap.
Handles. See Handles, Wood
Knife, Baby. See Switches, Battery & Baby Knife.
Lever Radio. See Radio Mounting.
Lever. See Switches, Snap, Lever.
Limit. See Controllers, Motor.
Mercury. See Switches, Mercury
Motor Starting. Magnetic Type. See Controllers.
Motor Starting. Non-Magnetic. See Switches, Motor Starting.
Pendant. See Switches, Snap.
Pressure Regulating. See Controllers.
Push Button, Snap. See Switches, Snap.
Push Button, Motor Starting. See Switches, Remote Control.
Radio Receiver. See Radio Mountings.
Range. See Switches Snap; Heavy Duty
Remote Control. See Switches, Remote Control.
Reversing. See Controllers.
Rotary. See Switches, Snap.
Safety. See Switches, Knife.
Snap. See Switches, Snap.
Starter Type. See Controllers.
Storage Battery. See Switches, Storage Battery.
Surface. See Switches, Snap.
Tank. See Switches, Tank.
Time. See Switches, Time.
Toggle. See Switches, Snap.
Tumbler. See Switches, Snap.

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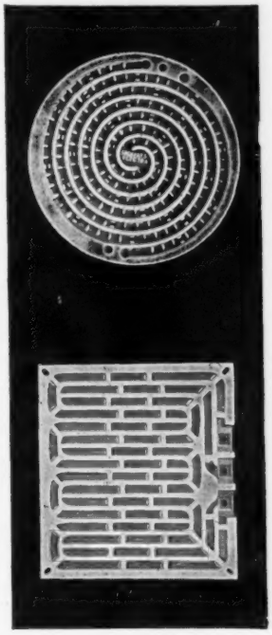

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SWITCHES, Battery and Baby Knife Cut-Out Switches.

Anti-Wood. See Kell & Son, Francis.
Bridgeport Switch Co., 209 Center, Bridgeport, Conn.
Bryant Electric Co., Bridgeport, Conn.
Chapman. See Frank W. Morse & Co.
Chicago Elec. Mfg. Co., 2801 S. Halsted, Chicago, Ill.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Circle T. See Trumbull Elec. Mfg. Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Crown. See Edwards & Co., Inc.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Edwards & Co., Inc., 140th & Exterior, New York, N. Y.
Electrad, Inc., 428 Broadway, New York, N. Y.
Eureka. See Frank W. Morse & Co.
Fahnestock Elec. Co., cor. East Ave. and 8th, Long Island City, N. Y.
Handy. See Chicago Elec. Mfg. Co.
H. & H. See Hart & Hegeman Div.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co. Hartford, Conn. (Push Button.)
Harwood. See Frank W. Morse & Co.
Heinemann Elec. Co., Trenton, N. J.
Jost. See Frank W. Morse & Co.
Kappa. See Trumbull Elec. Mfg. Co.
Kell & Son, Francis, 401 E. 163rd, New York, N. Y.
Kendrick & Davis Co., Lebanon, N. H.
Keystone. See Frank W. Morse & Co.
King Mfg. Co., B. C., 302 Park Ave., Brooklyn, N. Y.
Knox Porcelain Corp., Knoxville, Tenn.
K-P-F Elec. Co., 855 Howard St., San Francisco, Cal.
Kurz & Root, Appleton, Wis.
Leviton Mfg. Co., 236 Newell, Brooklyn, N. Y.
Lyons Mfg. Co. (Mt. Carmel), New Haven, Conn.
Majestic Elec. Mfg. Co., 30 N. 12th St., St. Louis, Mo.
Manhattan Elecl. Supply Co., 510 Sixth Ave., New York.
Morse Co., Frank W., Boston, Mass.
Partrick & Wilkins Co., Philadelphia, Pa.
Porcelain Products, Inc., Findlay, Ohio.
Powerlite Switchboard Mfg. Co., 4149 E. 79th, Cleveland, O.
Pullrite. See Frank W. Morse & Co.
Reliable Electric Co., 3145 Carroll Ave., Chicago, Ill.
Samson Electric Co., Canton, Mass.
Spero Elec. Mfg. Co., E. 33rd and Woodland Ave., Cleveland.
Sta-Rite. See Frank W. Morse & Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
Wood Elec. Co., C. D., 565 Broadway, New York, N. Y.

SWITCHES, Mercury

(For Temperature Control Apparatus.)

Con-Tac-Tor. See Time-O-Stat Controls Co.
Cooper Hewitt Electric Co., 410 Eighth Ave., Hoboken, N. J.
Cramblet Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Febrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
General Kontroler Co., 200 E. First, Dayton, O.
Kon-nec-tor. See Cooper Hewitt Elec. Co.
Kontax. See General Kontroler Co.
Meroid Corp., 564 W. Adams, Chicago, Ill.
Safety Regulator Co., 529 S. Mathews, Los Angeles, Cal.
Time-O-Stat Controls Co., Elkhart, Ind.

SWITCHES, Motor Starting

Accessible. See Trumbull-Vanderpoel Elec. Mfg. Co.
Aces. See Colt's Patent Fire Arms Mfg. Co.
Adam Elec. Co., Frank, St. Louis, Mo.
Aurora Steel Products Co., Aurora, Ill.
Barber Elec. Mfg. Co., North Attleboro, Mass.
Bull Dog Electric Products Co., Detroit, Mich.
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Columbia Metal Box Co., 228 E. 144th, New York, N. Y.
Crouse-Hinds Co., Syracuse, N. Y.
E. W. See Trumbull Elec. Mfg. Co.
FA. See Adam Elec. Co., Frank.
F. A. Triumph. See Metropolitan Elec. Mfg. Co.
Federal Steel Products Co., 2 Ave. L., Newark, N. J.
Large-Dail Mfg. Co., 606 Cherry, Philadelphia, Pa.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland, O.
Lundy Co., E. A., Fulton Bldg., Pittsburgh.
MacMillen Mfg. Co., 1400 N. Spring, Los Angeles, Cal.
Major. See Adam Elec. Co., Frank.
Mason. See Trumbull-Vanderpoel Elec. Mfg. Co.
Metropolitan Device Corp., 1250 Atlantic Ave., Brooklyn, N. Y.
Metropolitan Elec. Mfg. Co., Blvd. at 14th, Long Island City, N. Y.
Murray. See Metropolitan Device Corp.
Mutual. See Bull Dog Elec. Products Co.
Naro. See Metropolitan Elec. Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Nublade. See Colt's Patent Fire Arms Mfg. Co.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Robbins & Myers, Inc., Springfield, O.
Safe-Lock. See Trumbull-Vanderpoel Elec. Mfg. Co.
Safelock. See Westinghouse Elec. & Mfg. Co.
Schmuckler & Sons, 2333 N. 28th, Philadelphia, Pa.
Square D Co., Detroit, Mich.
S. S. See Wadsworth Elec. Mfg. Co.
Tanner & Co., Wm. F., 511 Sharp, Baltimore, Md.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
T. V. Safelock. See Trumbull-Vanderpoel Elec.
Unisafti. See Metropolitan Device Corp.
Unit-Versal. See Bull Dog Elec. Products Co.
Universal Metal Box & Products Co.
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Westinghouse Elec. & Mfg. Co., Mansfield, O.

SWITCHES, Remote Control

Push Button, Magnetically Operated.

Adam Electric Co., Frank, St. Louis, Mo.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Automatic Switch Co., 154 Grand, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Cutler-Hammer, Inc., 1287 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Dunco. See Struthers Dunn, Inc.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.
H P. See Palmer Elec. & Mfg. Co.
Industrial Controller Div. of Square D Co., Milwaukee, Wis.
Kato Engr. Co., Mankato, Minn.
Lincoln Elec. Co., Coit Rd. & Kirby Ave., Cleveland, O.
Major, F. A., System. See Adam Elec. Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Precise Mfg. Co., 254 Mill, Rochester, N. Y.
Protectoswitch. See Precise Mfg. Co.
R. C. O. C. See South Bend Current Controller Co.
Sauter. See Cramer & Co., R. W.
Signal Engineering & Mfg. Co., 146 W. 14th, New York
South Bend Current Controller Co., South Bend, Ind.

Struthers Dunn, Inc., 1135 Race, Philadelphia, Pa.
Takamine Corp., 208 Rawson St., Long Island City, N. Y.
Teeple Co., L. R., 540 E. Ninth, Portland, Ore.
Triplock. See Monitor Controller Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

SWITCHES, Snap

	KEY
Feed Through	See p
Fixture (Canopy, Candelabra and Key Arm)	See F
Flush	See f
Lever, Toggle, Tumbler	See L
Pendant	See p
Push Button	See P
Rotary	See R
Surface	See s

See Also Switches, Snap; Heavy Duty.

Adam Electric Co., Frank, St. Louis, Mo. f
Anylite Elec. Co., Ft. Wayne, Ind. L
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. f sp P R L F
Arrow Head. See Arrow Elec.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. f p P F
Best. See United States Elec. Mfg. Corp.
Brascolite. See Guth & Co., Edwin.
Bremer Elec. Mfg. Co., 139 N. 7th, Philadelphia, Pa. f
Bridgeport Switch Co., 209 Center, Bridgeport, Conn. L F
Bryant Elec. Co., Bridgeport, Conn. f sp P R L F
B. S. Co. See Bridgeport Switch Co.
Carling Tool & Machine Co., 32 Union Place, Hartford, Conn. F
Circle F. Mfg. Co., Trenton, N. J. f P L F
Circle T. See Trumbull Elec. Mfg. Co.
Commercial. See Gaynor Electric Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn. p P R L F
Crouse-Hinds Co., Syracuse, N. Y. L
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis. P L
Diamond H. See Hart Mfg. Co.
Dugie. See Bryant Elec. Co.
Economy Fuse Mfg. Co., 2717 Greenview Ave., Chicago, Ill. F
Gaynor Elec Co., Bridgeport, Conn. f L
General Elec. Co., Merchandise Dept., Bridgeport, Conn. f sp P R L F
Glo-Guide. See Bryant Elec. Co.
Gold Star Push Switch. See Hart & Hegeman.
Guth & Co., Edwin, 2615 Washington Ave., St. Louis, Mo. F
Hart Mfg. Co., Hartford, Conn. f sp P R L
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co. (Door Bolt Control) f sp P R L F
Hart. See Hart & Hegeman.
H. & H. See Hart & Hegeman Mfg. Co.
Hubbell, Inc., Harvey, Bridgeport, Conn. sp L F
Jost. See Morse, Frank W.
Kell & Son, Francis, 401 E. 163rd, New York, N. Y. f P
Leviton Mfg. Co., 236 Newell, Brooklyn F
Levolier. See McGill Mfg. Co.
McGill Mfg. Co., Valparaiso, Ind. f L F
Marks Products Co., 80 N. Ninth, Brooklyn, N. Y. L F
Metropolitan Elec. Mfg. Co., Blvd at 14th St., Long Island City, N. Y. s R
Morse Co., Frank W., 291 Congress, Boston P
National. See Standard Elec. Mfg. Co.
New England. See Paulding, John L.
Nutmeg. See Hubbell, Harvey, Inc.
Operite. See Morse Co., Frank W.
Pass & Seymour, Solvay Sta., Syracuse, N. Y. f sp P L F
Paulding, John L. New Bedford, Mass. f s P
Pen Tap. See Beaver Mfg. Co.
Perkins. See Bryant Elec. Co.
Pilot Radio & Tube Corp., 323 Berry, Brooklyn, N. Y. L
Pilotoggle. See Pilot Radio & Tube Corp.
Pilotoggle. See Pilot Elec. Mfg. Co.
Pullrite. See Morse, Frank W.
Rodale Mfg. Co., 200 Hudson, New York p
Sears, Henry D., 89 Boylston, Boston f sp P R L F
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa. P
Snapit. See Marks Products Co.
Spartan. See Bryant Elec. Co.
Standard Elec. Mfg. Co., 941 Wrightwood Ave., Chicago, Ill. f s P R L
Trigle. See Bryant Elec. Co.
Trumbull Elec. Mfg. Co., Plainville, Conn. f s P R L
Tumbolier. See Hart & Hegeman.
Twi-Lite. See McGill Mfg. Co.
United States Elec. Mfg. Corp., 222 W. 114th, New York, N. Y. f
Victor See Kell & Son, Francis.
Washington. See Gaynor Electric Co.
Weber See Sears, Henry D.
Werkrite. See Morse, Frank W.
Yankee. See Bryant Elec. Co.

SWITCHES, Snap; Heavy Duty

Heavy duty rotary snap switches for Electric Range and Small Motor Control.

Arrow Elec. Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Bryant Electric Co., Bridgeport, Conn.
Diamond H. See Hart Mfg. Co.
Domestic Electric Co., 7723 St. Clair Ave., Cleveland, Ohio.
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.

SWITCHES, Storage Battery; Automatic Disconnecting

Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Penn Electric Switch Co., Des Moines, Ia.
Radioloc. See Cutler-Hammer Mfg. Co.

SWITCHES, Tank

Blackburn-Smith Corp., 25 W. 45th, New York, N. Y.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Electrical Repair Co., 240 W. 25th, New York, N. Y.
General Electric Co., Schenectady, N. Y.
Industrial Controller Div. of Square D Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Leader-Trahern Products Co., Decatur, Ill.
Ostrander Elec. Wks., W. R., 911 Atlantic Ave., Brooklyn.
Penn Elec. Switch Co., 20th & Walnut, Des Moines, Ia.
Sundh Elec. Co., Parkhurst St. at Ave. C, Newark, N. J.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

SWITCHES, Time (Automatic Clock Operated Switches)

Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Astrachron. See Gem Engineering Co.
Automatic Elec. Heater Co., 1505 Race, Philadelphia, Pa.
Automatic Elec. Mfg. Co., Mankato, Minn.
Automatic Lighting Co., 831 Greenmount Ave., Baltimore.
Automatic Sprinkler Corp. of America, 910 B. of L. E. Bank Bldg., Cleveland, Ohio.
Automatic Timer Co., 1841 Euclid Ave., Cleveland, O.
Berry, A. Hall, 73 Murray, New York, N. Y.
Brown & Pengilly, Inc., 1264 Folsom, San Francisco, Cal.
Buckeye Time Switches, Inc., 1557 St. Clair Ave., Cleveland, O
Cackle. See Berry A. Hall.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Clark. See Automatic Heater Co.
Con-tac-tor. See Absolute Con-tac-tor Corp.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Frisch, Walter P., 104 Linden, Rochester, N. Y.
Gem Engineering Co., Hempstead, N. Y.
General Electric Co., Schenectady, N. Y.
Go-N-Set. See G. & S. Research Lab.
G. & S. Research Laboratory, 1269 Cochran Ave., Los Angeles, Cal.
Hart Mfg. Co., Hartford, Conn.
Hartford. See Berry A. Hall.
Horni Signal Mfg. Co., 290 Hudson, New York, N. Y.
Jewel. See Time Switch Sales & Service.
Knowles, W. E., 2869 Broadway, Oakland, Cal.
Kwixset. See Thompson Clock Co.
Lamp-Lighter. See Robbins & Myers Co.
Liberty Bell Mfg. Co., Minerva, Ohio.
Mercury Time Switch Co., Marine City, Mich.
Northwestern Clock Co., Omaha, Neb.
Ohio Time Switch Co., 1439 St. Clair Ave., Cleveland.
Paragon Elec. Co., 409 S. Dearborn, Chicago, Ill.
Racine. See Reliance Automatic Ltg. Co.
Radio Owl, 2269 E. 51st, Los Angeles, Cal.
Radio Switchman. See R-V Mfg. Co.
Reliance Automatic Ltg. Co., 1935 Meade, Racine, Wis.
Research Mfg. Laboratory, 1269 Cochran Ave., Los Angeles, Robbins & Myers Co., Springfield, O.
Ross Safety Switch Corp., 50 E. 42nd, New York, N. Y.
R-V Mfg. Co., Marshfield, Mass.
Sauter. See Cramer & Co.
States Co., Hartford, Conn.
Stromberg Electric Co., 223 W. Erie, Chicago, Ill.
Thompson Clock Co., H. C., Bristol, Conn.
Time Switch Sales & Service, 1841 Euclid Ave., Cleveland, O.
Tork Clocks, Inc., 12 E. 41st, New York, N. Y.
Walser Automatic Timer Co., 342 Madison Ave., New York.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

TACHOMETERS

Speed Indicators, Speedometers, Revolution Counters.

Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne & Windrim, Philadelphia.
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind.
Durant Mfg. Co., 655 Buffum, Milwaukee, Wis.
Electric Tachometer Corp., Spring Garden & Broad St., Philadelphia, Pa.
Holtzer-Cabot Elec. Co., Boston, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Productimeter. See Durant Mfg. Co.
Standco. See Sticht & Co.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Veeder Mfg. Co., 14 Sargeant, Hartford, Conn.
Weston Elecl. Instrument Co., 582 Frelinghuysen Ave., Newark, N. J.
Zernickow Co., O., 15 Park Row, New York, N. Y.

TAGS, Cable; Pole and Battery

American Radio Hardware Co., 135 Grand, New York, N. Y.
(Battery Lead Tags.)
Benedict Mfg. Co., East Syracuse, N. Y.
Brecklin Underground Elec'l Mfg. Co., Glenside, Pa.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Grammes & Sons, Inc., L. F., Allentown, Pa.
International Tag Co., 319 N. Whipple, Chicago, Ill.
Premax Products, Inc., Niagara Falls, N. Y.
Viking Tool & Machine Co., 745 65th, Brooklyn, N. Y.
Waterbury Button Co., Waterbury, Conn.

TAGS, Shipping

Campbell Paper Box Co., South Bend, Ind.
International Tag Co., 319 W. Whipple, Chicago, Ill.

TAMPING TOOLS, COIL. See Tools, Commutator Truing.
TANK SWITCHES. See Switches, Tank.
TANKS, TINNING. See Wire Manufacturing Machines.

TAPE, Asbestos

American Asbestos Co., Norristown, Pa.
Asbestos Fibre Spinning Co., North Wales, Pa.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
General Asbestos & Rubber Co., Charleston, S. C.
Johns-Manville Corp., New York, N. Y.
Matthews & Co., Jas. H., 3942 Forbes, Pittsburgh, Pa.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Niagrite. See Johns-Manville, Inc.
Shield Brand. See Mitchell-Rand Mfg. Co.

TAPE, Cotton, Linen, Silk; Tape, Sleeving, Webbing.

Alfalfa. See Burrell Belting Co.
Anchor Webbing Co., 300 Brook, Pawtucket, R. I. (Cotton, Silk).
Awabco. See Anchor Webbing Co.
Bermaline. See Burrell Belting Co.
Burrell Belting Co., 413 S. Hermitage Ave., Chicago, Ill.
Eagle. See Sidebotham, Inc., John.
General Electric Co., Schenectady, N. Y.
Gilmer Co., L. H., Cottman & Keystone Sts. (Tacony), Philadelphia, Pa.
Hope Webbing Co., 1005 Main, Providence, R. I.
Krout & Fite Mfg. Co., Allegheny Ave. & Emerald, Philadelphia, Pa.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sidebotham, Inc., John, 4317 Griscom, Philadelphia, Pa.
Smith Belting Co. (Germantown), Philadelphia, Pa.
Superfine. See Windsor Webbing Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Windsor Webbing Co., Pawtucket, R. I.
Worcester Braiding Co., 34 Southbridge, Worcester, Mass.

TAPE, Mica

Chicago Mica Co., 345 Campbell, Valparaiso, Ind.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 135 Johnson, Brooklyn, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Westinghouse Elec. & Mfg Co., East Pittsburgh, Pa.

TAPE, Rubber and Friction

Ackerman. See Ackurate Rubber Co.
Ackurate Rubber Co., 25 Beaver St., New York, N. Y.
Adamson & Co., Joseph, Columbia and Germantown Aves. Philadelphia, Pa.
Adhere. See Westinghouse Elec. & Mfg. Co.

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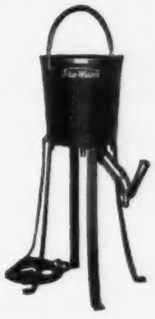

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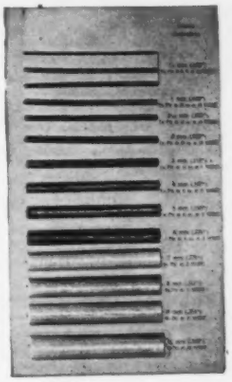

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The highest grade of "spaghetti" made; efficient insulation demands its use.

TAPE, Rubber and Friction—Continued
Alpha. See Johns-Manville, Inc.
Amazon. See Graybar Elec. Co.
Appleton Rubber Co., Franklin, Mass.
Black Diamond. See Dunton Co., M. W.
Boston Woven Hose & Rubber Co., Boston, Mass.
Brooklyn. See Johns-Manville, Inc.
Bull-Dog. See Boston Woven Hose & Rubber Co.
Candee. See Ackurate Rubber Co.
Canfield Rubber Co., Bridgeport, Conn.
Canton. See Plymouth Rubber Co.
Clifton. See Clifton Mfg. Co.
Clifton Mfg. Co., 65 Brookside Ave., Boston 30, Mass.
Competition. See New York Insulated Wire Co.
Double-Wear. See Dryden Rubber Co.
Dryden Rubber Co., 1014 S. Kildare Ave., Chicago, Ill.
Dun-Gee, A. & B. See Okonite Co.
Dunton Co., M. W., 670 Eddy St., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Elkhart Rubber Wks., Elkhart, Ind.
Firestone Tire & Rubber Co., Akron, O.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y.
Grimshaw. See New York Insulated Wire Co.
Griptite. See Canfield Rubber Co.
Holfast Rubber Co., Atlanta, Ga.
Holdtite. See United States Rubber Co.
Hydro-Proof. See Elkhart Rubber Wks.
Imperial Rubber Co., 220 Broadway, New York, N. Y.
Impervo. See Canfield Rubber Co.
Ireo. See Imperial Rubber Co.
Johns-Manville Corp., New York, N. Y.
Jomanco. See Johns-Manville, Inc.
Kerite Ins. Wire & Cable Co., 30 Church, New York, N. Y.
Manson. See Okonite Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
New York Insulated Wire Co., 114 Liberty, New York, N. Y.
Okonite Co., Passaic, N. J.
O. K. See Appleton Rubber Co.
P. & B. See Ruberoid Co.
Paratex. See Appleton Rubber Co.
Paruco. See Passaic Rubber Co.
Passaic Rubber Co., Clifton, N. J.
Plymouth Rubber Co., 1400 Revere, Canton, Mass.
Red-X. St. Louis Rubber Cement Co.
Relio. See United States Rubber Co.
Ruberoid Co., 95 Madison Ave., New York, N. Y.
S. I. See Superior Insulating Tape Co.
Sitco. See Superior Insulation Tape Co.
Slipknot. See Plymouth Rubber Co.
Star. See Sullivan & Sons Mfg. Co., J.
Sticka. See Graybar Elec. Co.
Stixwell. See Clifton Mfg. Co.
Sullivan & Sons Mfg. Co., J., 2224 N. 9th, Philadelphia, Pa.
Superior Insulating Tape Co., 3044 Lambdin Ave., St. Louis.
2-Plex. See Holfast Rubber Co.
U. S. See United States Rubber Co.
United States Rubber Co., 1790 Broadway, New York, N. Y.
Usco. See United States Rubber Co.
Van Cleef Bros., 7722 Woodlawn Ave., Chicago.
Victor. See Graybar Elec. Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Varnished Fabric
Acme Wire Co., New Haven, Conn.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Irvington Varnish & Insulator Co., Irvington, N. J.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
New Jersey Wood Finishing Co., Woodbridge, N. J.
Radiotape. See Respro, Inc.
Respro, Inc., Wellington Ave. (Auburn), Providence, R. I.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sico. See Standard Insulator Co.
Standard Insulation Co., East Rutherford, N. J.
Voltape. See Respro, Inc.

TAPING MACHINES, Coil
Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Griswold Machine Co., George, New Haven, Conn.
Ridlon Company, Frank, Boston, Mass.
Segur. See Electric Service Supplies Co.

TAPING MACHINES, Wire
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Wire Machinery Corp. of Am., New Haven, Conn.

TAPS. See Stocks, Dies and Reamers.

TENSION DEVICES, Coil Wire. See Racks, Wire Reel.

TENSION MACHINES, Band Wire
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.

TERMINALS AND CONNECTORS
Low Tension, Secondary Terminals and Connectors.
All-in-One. See Ohio Parts Co.
Barcy-Nicholson Co., 2801 Fort, W., Detroit, Mich.
Bassett Metal Goods Co., Derby, Conn. (General Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Burton-Rogers Co., Boston, Mass.
Cabelug. See Jones, Howard B.
Clark Metal Products, 490 Hancock Ave., Bridgeport.
Dixie Supply Co., 91 7th Ave., New York.
Double Grip. See Pons, Eugene
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electron. See Bassett Metal Goods Co.
Fahnestock Elec. Co., East Ave. and 8th, Long Island City, N. Y.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Ideal Clamp Mfg. Co., 193 Bradford, Brooklyn, N. Y.
Jones, Howard B., 2228 Wabansia, Chicago, Ill.
K. E. M. See Kuller Elec. Mfg. Co.
Kulier Elec. Mfg. Co., 575 Pierce Ave., Long Island City.
Morse Co., Frank W., Boston, Mass.
Nu-Way Snap. See Hatheway Mfg. Co.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati, O.
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa.
Patton-MacGuyer Co., Providence, R. I.
Pons, Eugene, 927 Campbell Ave., Schenectady, N. Y.
Peterson Co., 7 Beverly, Providence, R. I.
Rajah Co., Bloomfield, N. J.
Salem Elec'l Supply Co., Salem, Mass.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Shure. See Burton-Rogers Co.
Tinkerbox. See Weber Elec. Wks.
Waterbury, Button Co., Waterbury, Conn.
Weber Elec. Wks., Brooklyn Sta., Cleveland, O.
Wolverine Tube Co., 1415 Central Ave., Detroit, Mich.
Zierick Machine Wks., F. R., 6 Howard, New York.

TEST BENCHES, Armature
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Burton & Rogers Co., Boston, Mass.
Cowie Elctric Co., E. S., 1816 McGee, Kansas City, Mo.
Electric Machine Corp., 529 S. N. J., Indianapolis, Ind.
Hobart Bros. Co., Troy, Ohio.
Marshall Elec. Co., Elkhart, Ind.

Miho Company, 717 Sycamore, Cincinnati, Ohio.

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North East Electric Co., Rochester, N. Y.
Pence & Son, H. O., San Luis Obispo, Cal.
Weidenhoff, Joseph, 4352 W. Roosevelt Road, Chicago, Ill.

TESTING INSTRUMENTS. See Instruments.

TESTERS, Coil
(Includes Armature Growlers, trouble shooters, and other portable testing devices). See also Instruments
Ace. See Weidenhoff, Joseph.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Ankenbrandt, J. J., 2140 Wakeman, Toledo, Ohio.
Armeter. See Chapman Electric Works, P. E.
Bartlett Electric Products Co., Goshen, Ind. (Storage Battery).
Batt-O-Meter. See Indiana Mfg. & Elec. Co., also Case Elec.
Burton & Rogers Co., 857 Boylston, Boston, Mass.
Case Elec. Co., Marion, Ind.
Century Electrical Co., 102 Randall Ave., Syracuse, N. Y.
Chapman Elec'l Works, P. E., 1820 Chouteau Ave., St. Louis, Mo
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Columbia. See Weidenhoff, Joseph.
Comparometer Co., New Ulm, Minn.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo.
Economy. See Weidenhoff, Joseph.
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland.
Electric Machine Corp., 529 S. N. J., Indianapolis, Ind.
Electrotest. See Comparometer Company.
Elmco. See Electric Machine Corp.
Ev-Ri-Test. See Weidenhoff, Joseph.
Ga-Jit. See General Instrument Corp.
General Instrument Corp., 225 Varick, New York, N. Y.
Herald Elec. Co., 35 East End Ave., New York, N. Y.
Hobart Bros. Co., Troy, Ohio.
Ideal. See Ankenbrandt, J. J.
Indiana Mfg. & Electric Co., Marion, Indiana.
Kletzman Electrical Mfg. Co., 234 N. Central, Gilman, Ill.
Leich Electric Co., Genoa, Ill.
Lundin Electric Machine Co., 10 Thacher, Boston, Mass.
Mallory Electric Co., Factories Bldg., Toledo, Ohio.
Marshall Elec. Co., Elkhart, Ind.
Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Electric Co., Rochester, N. Y.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Paneltest. See Allen Elec. & Equip. Co.
Portometer. See Allen Elec. & Equip. Co.
Portostat. See Allen Elec. & Equip. Co.
Presto. See Metal Specialties Mfg. Co.
Reliable Parts Mfg. Co., Wellington, Ohio.
Rex Batrystat. See Bartlett Products Co.
Scout. See Leich Electric Company.
Serwell Sales Corp., 1740 N. Winchester Ave., Chicago, Ill.
Test-All. See Colpin Corp.
Test-O-Meter. See Weidenhoff, Joseph.
Test-Rite. See Colpin Corp.
Victory. See Weidenhoff, Joseph.
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill.

TESTING LABORATORIES
Baker & Co., Inc., 54 Austin, Newark, N. J.
Elec'l Testing Laboratories, 80th St. and East End Ave., New York, N. Y.
National Elec'l Inst. Co., 162 Sidney, Cambridge, Mass.
New York Testing Laboratories, 80 Washington, New York.
Rubicon, 29 N. 6th, Philadelphia, Pa.
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.

THERMO JUNCTIONS. See Instruments, Laboratory Standard.

THERMOSTATIC METAL
Baker & Co., Inc., 54 Austin, Newark, N. J.
Chace Valve Co., W. M., 1600 Beard Ave., Detroit, Mich.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I.
Improved Seamless Wire Co., 775 Eddy, Providence, R. I.
Interstate Products Corp., 29 Commercial, Newark, N. J.
Venbur. See Coffin Mfg. Co., B. F.
Wilco. See H. A. Wilson Co.
Wilson Co., H. A., Newark, N. J.

THERMOSTATS
American Thermostat Co., 226 Jelliff Ave., Newark, N. J.
Automatic Appliance Co., Jackson, Mich.
Bak-Rite. See Electric Appliance Mfg. Co.
Bishop & Babcock Sales Co., 4901 Hamilton Ave., N. E., Cleveland, O.
Boston Machine Wks. Co., 7 Willow, Lynn, Mass.
Brown. See Electric Automatic Appliance Co.
Brown Instrument Co., Wayne & Windrim, Philadelphia, Pa.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Cobb Elec. Appliance Co., 100 Massachusetts Ave., Boston.
Cramblett Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Diamond H. See Hart Mfg. Co.
Electric Automatic Appliance Co., Denver, Colo.
Electric Heat Control Co., 5002 Carnegie Ave., Cleveland, O.
Electric Maid. See Hankscraft Co.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Freas Thermo-Electric Co., 1206 S. Grove, Irvington, N. J.
Globe Mfg. Co., Battle Creek, Mich.
Hankscraft Co., 615 E. Washington, Madison, Wis.
Hart Mfg. Co., Hartford, Conn.
Hi-Lo. See Boston Machine Wks. Co.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.

THERMOSTATIC METAL
For Low and High Temperatures
Our No. 1800 metal for temperatures up to 450° F.
Our No. 2800 metal for temperatures up to 1500° F.
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1600 Beard Avenue, Detroit, Mich.

Interstate Products Corp., 29 Commercial, Newark, N. J.
King. See Electric Heat Control Co.
Klixon. See Westinghouse Electric & Mfg. Co.
Manhattan Elecl. Supply Co., 510 Sixth Ave., New York.
Marvel. See American Thermostat Co.
Mercoid Corp., 564 W. Adams, Chicago, Ill.
Moeller, A. E., 261 Sumpter, Brooklyn, N. Y.
Midget. See Coffin Mfg. Co., B. F.
National Steel Construction Co., 425 Fountenac, Seattle, Wash.
Pyratherm. See Federal Gauge Co.
Safety Regulator Co., 529 S. Mathews, Los Angeles, Cal.
Savatime Devices, Inc., 88 Manhattan, Rochester, N. Y.
Struthers Dunn, Inc., 1135 Race, Philadelphia, Pa.
Standard Thermometer Co., 65 Shirley, Boston 19, Mass.
Tagliabue Mfg. Co., C. J., 18 33rd, Brooklyn, N. Y.
Teegle Co., L. R., 840 E. 9th, Portland, Ore.
Thermolectric. See Bishop & Babcock Sales Co.
Thermomap. See Spencer Thermostat Co.
Time-O-Stat Controls Co., Elkhart, Ind.
Trent Co., Harold E., 439 N. 12th, Philadelphia, Pa.
Visaflame. See Mercoid Corp.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilcolator Co., Newark, N. J.

TIGHTENERS, Commutator
Elmes Engineering Works, Chas. F., 230 N. Morgan, Chicago, Ill.

TIME SWITCHES. See Switches, Time.

TINNING TANKS, WIRE. See Wire Manufacturing Machines.

TINSEL. See Wire, Insulated.

TINSEL, Cord and Thread
Belden Mfg. Co., 2310 B S. Western Ave., Chicago, Ill.
Diamond Braiding Mills, Chicago Heights, Chicago, Ill.
Frank & Co., M. J., 15 W. 39th St., New York, N. Y.
Hy-Sil Mfg. Co., Revere, Mass.
Kilo Co., 2 E. 23rd, New York, N. Y.
Koelle, Frederick C., Real Estate Trust Bldg., Philadelphia.
Lees Mfg. Co., 320 Broadway, New York, N. Y.
Montgomery Co., J. R., Windsor Locks, Conn.
Rockbestos Products Corp., Nicoll & Canner, New Haven, Ct.
Springfield Wire & Tinsel Co., Springfield, Mass.
Taft Co., R. C., 174 N. Franklin, Chicago, Ill.

TIPS, Cord
Duro. See McEvoy, C. H.
McEvoy, C. H., 430 Broadway, Lowell, Mass.
National Acme Mfg. Co., 7500 Stanton Ave., Cleveland, O.
Norden & Co., S. 180 S. Water, Providence, R. I.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y.
Waterbury Brass Goods Corp., Waterbury, Conn.

TOOLS, Commutator Slotting. See Slotting Machines & Tools, Commutator.

TOOLS, Coil Tamping
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.

TOOLS, Commutator Truing
Acme. See Green Equipment Corp.
Allen Elec. & Equipment Co., N. Pitcher St., Kalamazoo, Mich.
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Central Mfg. Co., Fairfield, Ia.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Elec. Co.
Jordan Bros., 74 Beekman, New York, N. Y.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, Ohio.

TOOLS, Storage Battery
Battery Equipment & Supply Co., 7530 Greenwood Ave., Chicago, Ill. Burning Racks, Battery Trucks, Plate Pressers, Mallets, Lead Burners and Strainers.
Battery Parts Co., Inc., Wilkinsburg, Pa. (Leads.)
Battery Tools Co., 29 Willow, Montclair, N. J.
Besco. See Battery Equipment & Supply Co.
Bobbett Elec. Mfg. Co., 811 E. 43rd St., Chicago, Ill. (Knife Heaters.)
Canedy-Otto Mfg. Co., 1816 McGee, Chicago Heights, Ill. (Floor Vises.)
General Elec. Co., Schenectady, N. Y. (Lead Burning Outfits.)
Heet-A-Knife. See Op-al Elec. & Mfg. Co.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati. (Terminals.)
Op-al Elec. & Mfg. Co., 1057 E. 30th St., Indianapolis, Ind. (Knife Heaters.)
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa. (Pillar Post Sleeves, Tongs, Reamers, Strap Punches, Terminal Pullers, Mallets, Lead Burners and Strainers. Racks or Stands, Terminal Post Shapers, Battery Analyzer, Post Sealing Machine, Plate Burning Press, Press and Stands.)
Pyratip. See General Elec. Co.
Reliable Parts Mfg. Co., Wellington, O. (Steamer and Still, Filler, Separator Cutter, Clips, Carrier, Post Cutter, Terminal and Cell Puller.)
Thompson Mfg. Co., Meadville, Pa. (Reamers, Terminal Post Pullers, Pressing Tongs.)

TORCHES AND FURNACES
Acetylene, Alcohol, Gasoline, Kerosene.
Bernz Co., Otto, Newark, N. J.
Clayton & Lambert Mfg. Co., Detroit, Mich.
Dreadnaught. See Wall Mfg. Supply Co.
Jim Dandy. See Lasher-Weeber Co.
Klein & Sons, Mathias, Chicago Ill.
Lasher-Weeber Co., 261 Franklin, Boston, Mass.
McGill Mfg. Co., Valparaiso Ind.
Peerless. See Lasher-Weeber Co.
Staysalite. See Klein & Sons, Mathias.

TORPEDO Cord. See Twine.

TORSION BALANCES. See Instruments, Laboratory Standard.

TRANSFORMERS
Radio. See Radio Circuit Components.
Gas Tube Sign. See Transformers, Oil Burner.
Oil Burner Ignition. See Transformers, Low & Intermediate Voltage.

TRANSFORMERS, Low and Intermediate Voltage
For Oil Burners, Gas Tube Signs, and other special purposes.
American Bosch Magneto Corp., Springfield, Mass.
American Transformer Co., Newark, N. J.
Ampertran Elec. Mfg. Co., Lynn, Mass.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.
Manhattan Elect. Supply Co., 510 Sixth Ave., New York.
Sorgel Electric Co., 89 W. Water, Milwaukee, Wis.
Standard Transformer Co., Warren, O.
Thordarson Elec. Mfg. Co., Huron & Kingsbury Sts., Chicago, Ill.
Uptigraff Mfg. Co., R. E., First National Bank Bldg., Pittsburgh, Pa.
Ward Leonard Elec. Co., Mt. Vernon, N. Y.
Webster Electric Co., Racine, Wis.

TRANSMISSION DRIVES. See Chain, Transmission.

TRANSMITTERS, Power
Controller drive giving a variety of speeds for use in connection with coil taping machines.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.

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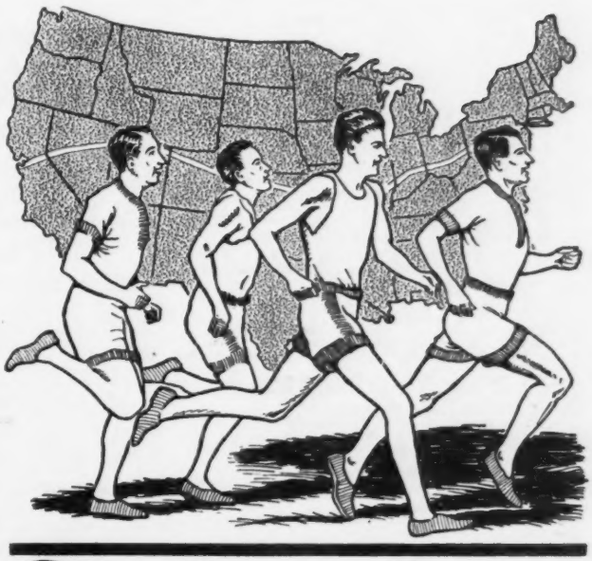

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Dayton·Ohio·U·S·A

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TROUBLE FINDERS. See Instruments, Portable and Switchboard; also Testers, Coil.
TRUCKS, Armature. See Lifts, Armature.

TRUCKS, Factory Steel

Angle Steel Stool Co., Plainwell, Mich.
TRUING Devices, Commutator. See Tools, Commutator.
TUBE (Tubes) (Tubing) Adapters. See Radio Receiver Parts.
Brass. See Tubing, Brass.
Condenser. See Tubing, Brass and Copper.
Copper. See Tubing, Brass.
Cutters. See Stocks, Dies, etc.
Fibre. See Fibre.
Fibre Candle. See Candles.
Mica. See Mica.
Paper. See Tubes, Paper.
Platinum. See Platinum.
Pyrometer. See Cores, Resistance.
Refractory. See Cores, Resistance.
Radio. See Radio Vacuum Tubes.
Varnished Fabric. See Tubing, Varnished Fabric.

TUBES, Paper; Cores; Sleeves, Bushings

Cleveland Container Co., 10800 Berea Rd., Cleveland, O.
Climax Tube Co., Mystic, Conn.
Klimaxcore. See Climax Tube Co.
McCausland, J. E., 86 Valley, Providence, R. I.
Pairpoint Corp., New Bedford, Mass.
Reliable Elec. Co., 3145 Carroll Ave., Chicago, Ill.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa.
Stone Paper Tube Co., 38 O. N. E., Washington, D. C.
Textile Tube Co., Fall River, Mass. (Paper Sleeves.)

TUBING, Brass and Copper

Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.
Baltimore Tube Co., Baltimore, Md.
Bridgeport Brass Co., Bridgeport, Conn.
Bull Dog. See National Elec. Products Corp.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., T. E., 54 Lafayette, New York.
Cook, Dunbar Smith Co., 85 Sprague, Providence, R. I.
Dallas Brass & Copper Co., 820 Orleans, Chicago, Ill.
French Mfg. Co., 128 Robbins, Waterbury, Conn.
Mueller Brass Co., Port Huron, Mich.
National Copper & Smelting Co., 1395 Coltman Rd., Cleveland, O.
National Elec. Products Corp., Pittsburgh, Pa.
Randolph Clowes Co., Waterbury, Conn.
Relleum. See Mueller Brass Co.
Roberts Tube Works, 2500 Military Ave., Detroit, Mich.
Rome Brass & Copper Co., Rome, N. Y.
Rome Hollow Wire & Tube Co., Rome, N. Y.
Rome Turney Radiator Co., Rome, N. Y.
Scovill Mfg. Co., Waterbury, Conn.
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa.
Summertill Tubing Co., Bridgeport, Pa.
Torrington Mfg. Co., Torrington, Conn.
United Wire & Supply Co., 1497 Elmwood Ave., Providence.
Wells Co., A. H., Watertown Ave., Waterbury, Conn.
Wolverine Tube Co., 1415 Central Ave., Detroit, Mich.

TUBING, Flexible Metallic

(Flexible Tubing.)
Almond Mfg. Co., T. R., Ashburnham, Mass.
American Metal Moulding Co., 146 Colt St., Irvington, N. J.
Auto-Brassflex. See National Metal Molding Co.
Auto-Steelflex. See National Metal Molding Co.
Breeze Corp., Inc., 24 S. 6th, Newark, N. J.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
National Elec. Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa.
Riflex. See United Metal Hose Co.
Sleeper & Hartley, Inc., Worcester, Mass.
Time-O-Stat Controls Co., Elkhart, Ind.
Titeflex Metal Hose Co., Newark, N. J.
Triangle Conduit Co., Dry Harbor Rd. and Cooper Ave., Brooklyn, N. Y.
United Metal Hose Co., 724 Garrison Ave., New York, N. Y.
White Dental Mfg. Co., S. S., 152 W. 42nd, New York.

TUBING, Rubber

Rubber Tubing for Insulating Wire in Instruments and Telegraph Signal Lines.
Canfield Rubber Co., 702 Railroad Ave., Bridgeport, Conn.
Eisler Electric Corp., 756 S. 13th, Newark, N. J.
Faultless Rubber Co., Ashland, O.
Forest City Rubber Co., 1276 Ontario, Cleveland, O.
Goodrich Rubber Co., B. F., Akron, O.
Rubber-Vac. See Eisler Electric Corp.
Tyler Rubber Co., Andover, Mass.
Vulcanized Rubber Co., 251 Fourth Ave., New York, N. Y.

TUBING, Varnished Fabric

Insulating Tubing—Spaghetti.
Acme Wire Co., New Haven, Conn.
Alpha Radio Supply Co., 520 Broadway, New York, N. Y.
Bentley-Harris Mfg. Co., Conshohocken, Pa.
Brand & Co., William, 268 Fourth Ave., New York, N. Y.
Empire. See Mica Insulator Co.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Insulated Duct & Cable Co., Stokes, Trenton, N. J.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Lee Tire & Rubber Co., Conshohocken, Pa.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky. (Insulated Waxed Cotton.)
Turbo. See Brand & Co.
Varflex Corp., Rome, N. Y.
TURNED-UP BOXES AND CABINETS. See Cabinets, Sheet Steel.
TURNING TOOLS, COMMUTATOR. See Tools, Commutator Truing.

TWINE, Armature Winding; Torpedo Cord

Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Winne & Son, Frank W., 42 N. Front, Philadelphia, Pa.
UNDERCUTTERS, Mica. See Slotting Machines & Tools, Commutator.
UNITS, Refrigerator Condenser. See Condenser Units, Refrigerator

UNITS, Rods and Grids, Resistance

Acme Elec. Heating Co., Dept. R, 1217 Washington, Boston.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Automatic Electric Heater Co., 1706 Race, Philadelphia, Pa.
Bradleyunit. See Allen Bradley Co.
Buffalo Products Co., Broome & Lafayette Sts., New York.
Burger, J. P., 1813 Columbus Rd., Cleveland, O.
Calrod. See Edison Elec. Appliance Co.
Chromalox. See Edwin L. Wiegand Co.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Crown Coloring & Chemical Co., 33 W. 17th, New York.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Dalton Elec. Heating Co., 287 Bridge St., Salem, Mass.
Dalton-Marsh Co., 88 Holten, Danvers, Mass.
Daric Co., 35 E. 21st, New York, N. Y.
Di-El-Ite. See Wirt Co.
Dixon Crucible Co., Jos., Jersey City, N. J.
Eagle Elec. Mfg. Co., 50 Hall, Brooklyn, N. Y.
Edgerset. See Industrial Controller Div.

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Edgewound. See Monitor Controller Co.
Edison Electric Appliance Co., 5600 W. Taylor, Chicago, Ill.
Elec. Controller & Mfg. Co., 2700 E. 79th, Cleveland, O.
Electro Thermal-Unit Co., 44 N. Fourth, Philadelphia, Pa.
Elemite. See Louthan Mfg. Co.
Fitz-All. See Eagle Elec. Mfg. Co.
Fitz-All. See Rodale Mfg. Co.
Fitz-Rite. See Rodale Mfg. Co.
Fix-All. See Witlow Elec. Mfg. Co.
F & M. See Hiram Marks Elec. Co.
General Electric Co., Schenectady, N. Y.
Globar Corp., Niagara Falls, N. Y.
Glo-Well. See Eagle Elec. Mfg. Co.
Gold Seal Elecl. Co. of Ohio, Inc., 250 Park Ave., New York, N. Y.
Hance-Parker Mfg. Co., Meriden, Conn.
Hankscraft Co., 615 E. Washington, Madison, Wis. (Oven Heater Unit.)
Hardwick, Hindle, Inc., 122 Greenwich, New York, N. Y.
Hexwound. See Monitor Controller Co.
Industrial Controller Div. of Square D Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Industrial Heater Co., 300 Canal, New York, N. Y.
International Resistance Co., 2006 Chestnut, Philadelphia, Pa. (Radio Resistance.)
Krischer's Mfg. Co., 355 Calyer, Brooklyn.
Louthan Mfg. Co., East Liverpool, O.
Marks, Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.
Monitor Edgewound. See Clark Controller Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Nelco. See Nelson Electric Co.
Nelson Electric Co., Plant City, Fla.
Northern Electric Co., 2833 N. Western Ave., Chicago, Ill.
Ogden Mfg. Co., 3947 Armitage Ave., Chicago, Ill.
Ohmite Mfg. Co., 636 N. Albany Ave., Chicago, Ill.
Ohm-Span. See States Co.
Op-al Elec. & Mfg. Co., 1057 W. 30th, Indianapolis, Ind.
Parker & Co., J. C., 497 Bulletin Bldg., Philadelphia, Pa.
Poloron Elec. Mfg. Co., 30 Bond, New York, N. Y.
Presto Products Co., 64 University Place, New York, N. Y.
Prometheus Elec. Corp., 358 W. 13th, New York, N. Y.
Pyrox. See Westinghouse Elec. & Mfg. Co.
Reben Elec. Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Remco. See Reben Elec. Mfg. Co.
Renuall. See Ogden Mfg. Co.
Repairall. See Waage Elec. Co.
Replacecall. See Waage Elec. Co.
Ribohm. See Ward Leonard Elec. Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Rubicon Co., 29 N. Sixth, Philadelphia, Pa.
Security Elec. Mfg. Co., 2635 Canton St., Chicago, Ill.
Sesco. See Automatic Electric Heater Co.
Smith & Co., T. C., 3615 Powelton Ave., Philadelphia, Pa.
Smoothwound. See Monitor Controller Co.
Snoco. See Snow & Co.
Snow & Co., E. W., Rochester, N. Y.
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa
Super. See Northern Elec. Co.
United Metal Art Mfg. Co., 293 Wyckoff Ave., Brooklyn, N.Y.
Vitrohm. See Ward Leonard Elec. Co.
Waage Elec. Co., 5100 W. Ravenswood Ave., Chicago.
Ward Leonard Elec. Co., 31 South, Mt. Vernon, N. Y.
Warren Elec. Appliance Co., Warren, Pa.
Watlow Elec. Mfg. Co., 1320 N. 23rd, St. Louis, Mo.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
Wiegand Co., Edwin L., 421 First Ave., Pittsburgh, Pa.
Wirt Co., 5221 Greene, Philadelphia, Pa.
VACUUM CLEANER BAGS. See Bags, Vacuum Cleaner.
VACUUM DRYING & IMPREGNATING OVENS. See Ovens, Industrial.
VACUUM PUMPS. See Pumps, Vacuum.

VALVES, Electrically Operated

Asco. See Automatic Switch Co.
Automatic Switch Co., 154 Grand, New York.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Crane Co., 836 Michigan Ave., S., Chicago, Ill.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Electric-Valve Mfg. Co., 68 Murray, New York, N. Y.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Gas-Gard Co., 375 Main St., E., Rochester, N. Y. (Gas.)
General Electric Co., Schenectady, N. Y.
Golden-Anderson Valve Specialty Co., 1385 Fulton Bldg., Pittsburgh, Pa.
Lunkenheimer Co., Cincinnati, O.
Minneapolis-Honeywell Regulator Co., Fourth Ave. & 28th, Minneapolis, Minn.
Nacco Mfg. Co., 1482 Clara Ave., St. Louis, Mo.
Northside Elec. Co., 4227 Spring Grove Ave., Cincinnati, O.
Protect-U. See Zisch Engineering Corp.
Reading Steel Casting Co., Bridgeport, Conn.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
St. Louis Motor Valve Co., St. Louis, Mo.
Tagliabue Mfg. Co., C. J., 18-83rd St., Brooklyn, N. Y.
Teeple Co., L. R., 540 E. Ninth, Portland, Ore. (Gas.)
Time-O-Stat Controls Co., Elkhart, Ind.
Victor. See Lunkenheimer Co.
Zisch Engineering Corp., 39 Avenue L, Newark, N. J. (Gas.)
VARNISH. See Paint, Varnish, Lacquer.
VARNISHED TAPE. See Tape, Varnished Fabric.
VARNISHED TUBING. See Tubing, Varnished Fabric.
VOLT BOXES. See Instruments, Laboratory Standard.

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VOLTMETERS. See Instruments.
VULCANITE. See Rubber, Hard.

VULCANIZERS, WIRE INSULATION

American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Biggs Boiler Works Co., Akron, Ohio.
WASHERS, FIBRE. See Fibre.

WASHERS, Leather

Michigan Leather Washer Co., 548 E. Fort, Detroit, Mich.

WASHERS, Lock

Keystone. See Positive Lock Washer Co.
National Lock Washer Co., Newark, N. J.
Positive Lock Washer Co., Ave. A & Miller, Newark, N. J.
Shakeproof Lockwasher Co., 2513 N. Keeler Ave., Chicago.
St. Louis Malleable Casting Co., 7701 N. Conduit Ave., St. Louis, Mo.

WASHERS, Metallic

Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Massachusetts Machine Shop, Inc., Boston, Mass.
New England Screw Co., Dept. A., 44 Farnsworth, Boston.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Wrought Washer Mfg. Co., 46 S. Bay, Milwaukee, Wis.
WATTMETERS. See Instruments.

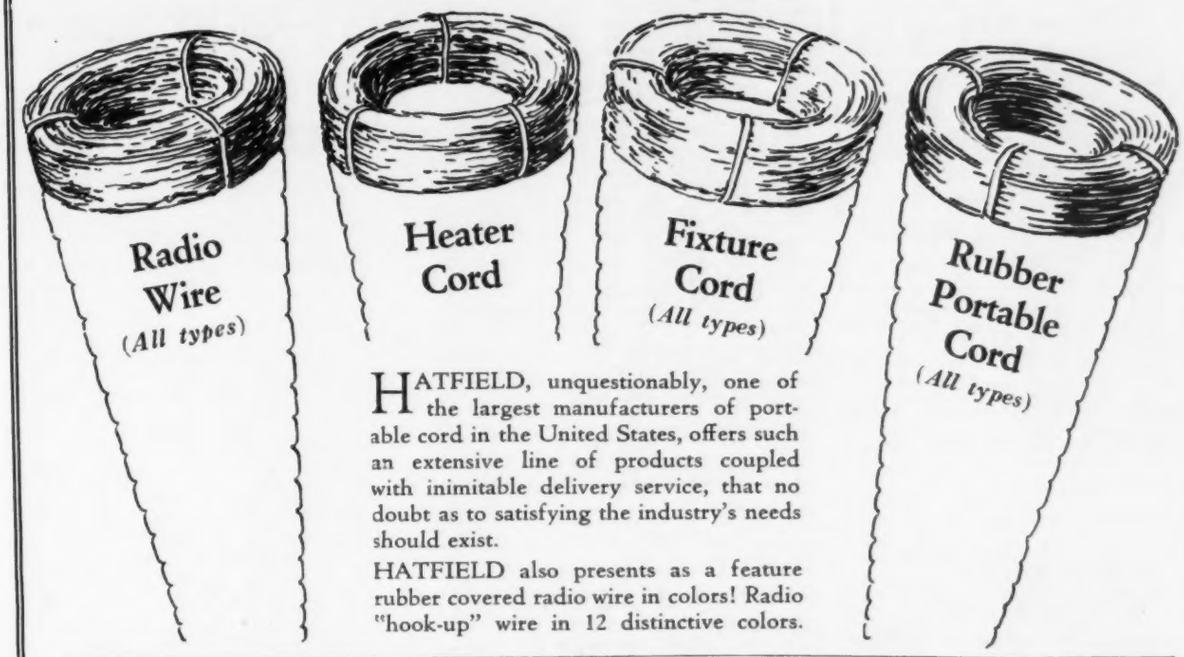
WAX AND COMPOUNDS

Wax and Compound, Sealing and Filling.....See W
Junction Box, Potheads, Battery Tops, Bolt Head Holes.
Wax and Compound.....See S
Saturating and Finishing, Braided Wire, Impregnating Fabric and Paper.
Chatterton's Compound .....See C
Ackurate Rubber Co., 25 Beaver, New York, N. Y. W . . ..
Ajax. See Sherwin-Williams Co.
Asphalt Products Co., 6531 S. State, Chicago.. . . S ..
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. C
Biwax Corp., 208 S. La Salle, Chicago, Ill.... W S . .
Black Nego. See Williams Co., F. M.
Bulls-Eye. See Zinsser & Co.
Candy & Co., 35th and Maplewood Ave., Chicago W S . .
Clifton Mfg. Co., 65 Brookside Ave., Boston.... . . . C
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J. . . . . W S . .
Dolph Co., John C., 168 Emmet, Newark, N. J. W . . . .
Di Electric Puttis. See Ackurate Rubber Co.
Ever-Protect. See National Cable Compound Co.
Flake White. See Williams Co., F. M.
General Electric Co., Merchandise Dept., Bridgeport, Conn. . . . . W . . ..
George Co., P. A., 4153 Bingham Ave., St. Louis. W . . ..
Globe Chemical Co., Murray Road & Big 4 R. R. St. Bernard, Cincinnati, O. . . . . W S . .
Goldo Brown. See Williams Co., F. M.
Great Lakes Thread & Yarn Co., 5133 Wesson Ave., Detroit, Mich . . . . . W . . ..
Hercules Powder Co., 975 Market, Wilmington, Del. (Wood Rosin) . . . . . S . .
Hexulate. See Tar Products Corp.
Imco. See Great Lakes Thread & Yarn Co.
India Red Seal. See Williams Co., F. M.
Insulatine Co., 1 Broadway, New York..... W . . ..
Knox & Morse Co., 80 Freeport, Boston, Mass..... W S . .
Leverite. See Mitchell-Rand Mfg. Co.
Lime Seal. See Mitchell-Rand Mfg. Co.
McGill Mfg. Co., Valparaiso, Ind..... . . . C
Minerallac Elec. Co., 1045 Washington Blvd., Chicago, Ill. . . . . W . . ..
Mitchell-Rand Mfg. Co., 19 Vesey, New York.... W S C
Mule-Hide. See Lehon Co.
National Cable Compound Co., Mitchell, Ind.... W . . ..
National War Co., 189 W. Madison, Chicago, Ill. . . S . .
Nu-Blac. See Star Porcelain Co.
Par Flexo. See Williams Co., F. M.
Rubberseal. See Mitchell-Rand Mfg. Co.
Rub-Flexo. See Williams Co., F. M.
Seldner & Enequist, Inc., 86 Hausman, Brooklyn, N. Y. . . . . W . . ..
Sherwin-Williams Co., Cleveland, O. . . . . W . . C
Standard Varnish Wks., 433 4th Av., New York.. W . . ..
Standard Wax & Import Co., 110 E. 42nd, New York, N. Y. . . . . W S . .
Star Porcelain Co., Trenton, N. J. . . . . W . . C
Tacrite. See Seldner & Enequist, Inc.
Tar Products Corp., Providence, R. I.
Trotter & Co., E. T., 576 Johnson Ave., Brooklyn, N. Y. . . . . W S . .
Waverly Oil Wks., 54th and A. V. R. R., Pittsburgh, Pa. . . . . S . .
Williams Co., F. M., 1288 Prospect Ave., Brooklyn, N. Y.
Zinsser & Co., 48 Vesey, New York, N. Y..... W . . ..

WEDGE DRIVERS. See Tools, Cummutator.
WELDS, Lamp Lead-in. See Filaments, Incandescent

WELDING AND CUTTING OUTFITS

Electric Arc, Spot, Butt and Seam Metal Welders and Metal Cutting Outfits.
Acme Elec. Welder Co., 1850 W. Fulton, Chicago, Ill.
A. E. F. See American Electric Fusion Corp.
Agnew Electric Welder Co., Milford, Mich.
Allan Mfg. & Welding Co., Inc., 736 Washington, Buffalo
Almane. See Allan Mfg. & Welding Co., Inc.
Alternarc. See Electric Arc Cutting & Welding Co.
American Elec. Fusion Corp., 2610 Diversey Ave., Chicago
Ames Co., 115 Ninth, Brooklyn, N. Y.
Burke Electric Co., Erie, Pa.
Cushing Mfg. Co., 5617 Pacific Blvd., Los Angeles, Cal.
Dwyer Machine Co., Lynn, Mass.
Economy Electric Products Co., 2400 Woodland Ave., Cleveland, O.
Eisler Electric Corp., 756 S. 13th, Newark, N. J.
Electric Arc Cutting & Welding Co., 156 Jelliff Ave., Newark, N. J.
Electric Welding Co. of America, 744 Court, Brooklyn, N. Y.
Electric Welding Machine Co., 1530 Larned, E., Detroit.
Farwest Electric Welder Co., 1107 Northlake Ave., Seattle.
Federal Machine & Welder Co., Dana Ave., Warren, O.
Fleet-Weld. See Lincoln Elec. Co.
Fusion Welding Corp., 10257 Torrence Ave., Chicago.
General Electric Co., Schenectady, N. Y.
General Engrg. & Supply Co., 160 5th Ave., New York, N. Y
Gibb Welding Machines Co., Bay City, Mich.
Hansen. See Northwestern Mfg. Co.
Hollup Corp., C. H., 3333 W. 48th Place, Chicago, Ill.
Lincoln Electric Co., Cott Rd. and Kirby Ave., Cleveland.
McAdams Co., J. C., New Britain, Conn.
Northwestern Mfg. Co., 480 Clinton, Milwaukee, Wis.
Owen Elec. Mfg. Co., Fayetteville, N. C.
Plastic Arc. See Wilson Welder & Metal Co.
Pyrotip. See General Elec. Co.
Rverson & Son, Jos. T., 2558 W. 16th, Chicago, Ill.
Sellars Arc Welder Co., 1200 Fourth Ave., Seattle, Wash.
Seneca Electric Welder Corp., 5057 Woodward, Detroit, Mich.
Siemund Wenzel Electric Welding Co., 79 Hancock, Long Island City, N. Y.



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Una Welding & Bonding Co., 1615 Collamer Ave., Cleveland, O.
U. S. L. Battery Corp., Niagara Falls, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilson Welder & Metal Co., Hoboken factory, Terminal Bldg., Hoboken, N. J.
Zeus. See Gibb Welding Machine Co.

WHEATSTONE BRIDGES. See Instruments, Laboratory Standard.

WICKS, Lubricating

Brawley, T. R., 279 20th, Brooklyn, N. Y.

WINDERS

Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Coil. See Winding Machines, Armature & Field Coil.
Electromagnet. See Winding Machines, Induction Coil.
Filament. See Machines, Lamp Making.
Induction Coil. See Winding Machines, Induction Coil.
Loop. See Winding Machines, Armature & Field Coil.

WINDING MACHINES, Armature and Field Coil

Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Conran, Frederick M., 177 New York Ave., Newark, N. J.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Handy. See Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Herald Electric Co., 35 East End Ave., New York, N. Y.
Hunsdorf, Wm., 2056 E. Fourth, Cleveland, O.
Liberty Starter Co., 271 Vinewood Ave., Detroit, Mich.
Line, W. C., 208 S. Geddes, Syracuse, N. Y.
Munsdorf Company, W. P., 720 Frankfort, Cleveland, Ohio.
Mutual Foundry & Machine Co., Atlanta, Ga.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ridlon Co., Frank, 253 A St., Boston, Mass.
Segur. See Electric Service Supplies Co.
Superior. See Armature Coil Equipment Co.

WINDING MACHINES, Induction Coil

Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Conron, Frederick M., 177 New York Ave., Newark, N. J.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Leesona. See Universal Winding Co.
Line, W. C., 208 S. Geddes, Syracuse, N. Y.
Morris Register Co., 29th & Broadway, Council Bluffs, Iowa.
Radio Production Machinery Co., 212 Centre, New York.
Universal Winding Co., Boston, Mass.
Viking Tool & Machine Co., 747 65th, Brooklyn, N. Y.
Weehawken Engineering Co., 543 Gregory Ave., Weehawken, N. J.

WINDINGS. See Coils, Finished.

WINDOW SHADES, Factory

Athey Co., 6142 West 65th St., Chicago, Ill.

WIRE (Cable) (Cord), Aluminum. See Aluminum.
Copper Clad. See Wire, Copper Clad.
Forms. See Forms, Wire.
Frames. See Forms, Wire.
Fuse. See Fuses and Fuse Wire.
Molybdenum See Molybdenum.
Phosphor Bronze. See Phosphor Bronze.
Platinum. See Platinum.
Radio Bus. See Wire, Bare.
Scrapers. See Strippers.
Strippers. See Strippers.
Tungsten. See Filament, Incandescent Lamp.

WIRE, Bare

Armature Banding	See S
Copper Wire	See C
Iron Wire	See S
Phosphor Bronze	See B
Radio Bus Wire	See C
Resistance Wire	See R
Steel Wire	See S

Acme. See Alloy Metal Wire Co.
Advance. See Driver Harris Wire Co.
Alloy Metal Wire Co., Moore, Pa. ..... C R ..
American Copper Products Corp., 233 Broadway, New York, N. Y. ..... C R ..
American Electrical Works (Philipsdale), Providence, R. I. ..... C ....
American Insulated Wire & Cable Co., Div. of General Cable Corp., 954 W. 21st, Chicago.... C .. S
American Steel & Wire Co., 208 S. La Salle.
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y. ..... C ....
Anylite Elec. Co., Fort Wayne, Ind. ..... C ....
Ballast. See Gilby Wire Co.
Baltimore Copper Mills (Div. of General Cable Corp.), Baltimore, Md. ..... C ....
Bassett Metal Goods Co., Derby, Conn. (General Sales Agent, Hatheway & Co., 16 Hudson, New York, N. Y. ..... C ..
Belden Mfg. Co., 2310B S. Western Ave., Chicago C .. S
Beldenite. See Belden Mfg. Co.
Bradford, Kyle & Co., Plymouth, Mass. ..... B ..
Braidite. See Cornish Wire Co.
Brenvar. See American Insulated Wire & Cable Co.
Bridgeport Brass Co., Bridgeport, Conn. ..... C ....
Calido. See Driver Harris Wire Co.
Chromel. See Hoskins Mfg. Co.
Chromic. See Murray-Harris Wire Co.

Climax. See Driver Harris Wire Co.
Comet. See Driver Harris Wire Co.
Comin. See Gilby Wire Co.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I. C ....
Copel. See Hoskins Mfg. Co.
Copperweld Steel Co., Glassport, Pa. ..... C .. S
Cornish Wire Co., 30 Church, New York, N. Y.. C ....
Corwico. See Cornish Wire Co.
Crape. See Indiana Steel & Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J.. C ....
Cupron. See Gilby Wire Co.
Darow Mfg. Co., 36 E. 20th, New York, N. Y... C ....
Detroit Insulated Wire Co., Detroit, Mich..... C ....
1885. See Chicago Insulated Wire & Mfg. Co.
Driver Harris Wire Co., Harrison, N. J..... .. R ..
Electron. See Bassett Metal Goods Co.
Excellicier. See Branford Elec. Co.
Fullman Mfg. Co., 1209 Jefferson, Latrobe, Pa. ....
Gilby Wire Co., Riverside Ave., Newark, N. J.... .. R
Goldmark Co., James, 83 Warren, New York.. C ....
Hope Webbing Co., Providence, R. I. (Braided Wire Tape) ..... C ....
Hoskins Mfg. Co., 4445 Lawton Ave., Detroit, Mich. .... R ..
Hudson Wire Co., Ossining, N. Y. ..... C R ..
Ideal. See Driver Harris Wire Co.
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. ..... C .. S
Indiana Steel & Wire Co., Muncie, Ind. .... S
Karma. See Driver Harris Wire Co.
Keystone. See Fullman Mfg. Co.
Lucero. See Driver Harris Wire Co.
Marion Insulated Wire & Rubber Co., Marion, Ind. C ....
Monex. See Standard Alloy Wire Co.
National-Harris Wire Co., 195 Verona Ave., Newark, N. J. ..... R ..
Nehring Electrical Works, De Kalb, Ill. ..... C ....
Nichrome. See Driver Harris Wire Co.
Novar. See Standard Alloy Wire Co.
Page Steel & Wire Co., Bridgeport, Conn. .... S
Paranite. See Indiana Rubber & Insulated Wire Co.
Peerless. See Alloy Metal Wire Co.
Phillips Wire Co., Pawtucket, R. I. ..... C ....
Phono-Electric. See Bridgeport Brass Co.
Premier. See Alloy Metal Wire Co.
Providence Insulated Wire Co., Providence, R. I.. C ....
Race. See Ross Wire Co.
Revolute Wire Co., Hastings-on-Hudson, N. Y.... C ....
Rice Co., A. H., Pittsfield, Mass. ..... C ....
Roebling's Sons Co., John A., Trenton, N. J..... C .. S
Rome Wire Co., Div. of General Cable Co., Rome, N. Y. ..... C ....
Ross Wire Co., 69 Bath, Providence, R. I..... C ....
Seneca Wire & Mfg. Co., Fostoria, O. .... S
Silcrimp. See Valley Narrow Fabric Co.
Silectron. See Standard Alloy Wire Co.
Solar. See Gilby Wire Co.
Sparg Wire Co., J. A., Rome, N. Y..... C ....
Standard Alloy Wire Co., Elizabeth, N. J. .... R S
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa. ..... C ....
Super-Insulated Wire Co., Plymouth, Mass. ..... C ....
Superior. See Alloy Metal Wire Co.
Talking Tape. See Hope Webbing Co.
Therlo. See Driver Harris Wire Co.
Tophet. See Gilby Wire Co.
Tru-Lay. See Page Steel & Wire Co.
Valley Narrow Fabric Co., Falls, R. I.
Wheeler Insulated Wire Co., Bridgeport, Conn.. C ....

WIRE, Copper Clad

American Steel & Wire Co., 208 S. La Salle, Chicago, Ill.
Copperweld Steel Co., Rankin, Pa.
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa.

WIRE SOLDER. See Solder, Bar and Wire.

WIRE DRAWING MACHINES

Drawing and Re-drawing Mill Equipment for Small Wires
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Sleeper-Hartley, Inc., Worcester, Mass.
Torrington Manufacturing Co., 70 Franklin, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio.
Wire Machinery Corp. of Am., New Haven, Conn.

WIRE, Insulated

	KEY
Annunciator, Office, Bell Wire	See A
Asbestos Covered Heater Cord	See H
Asbestos Covered Magnet Wire	See M
Enameled Magnet Wire	See M
Fixture Wire	See R
Flexible Reinforced Heavy Duty Cord	See F
Heater Cord	See H
Ignition Cable	See R
Lamp Cord	See R
Magnet Wire	See M
Rubber Covered Wire & Cable	See R
Stove Wire	See H
Telephone Cord	See T

A-A Wire Co. (Div. of General Cable Corp), 420 Lexington Ave., N. Y. C.. R .. ..
A-1 Brand. See American Insulated.
Acme Wire Co., New Haven, Conn.
Enameled Silk, Cotton .... M
Amelectric. See American Elec.
American Brand. See American Insulated Wire & Cable Co.
American Copper Products Corp., 233 Broadway, New York, N. Y. ....
American Electrical Works (Philipsdale), Providence, R. I. .... M
American Enameled Magnet Wire Co., Muskegon, Mich. .... M
American Insulated Wire & Cable Co., Div. of General Cable Co., 954 W. 21st, Chicago, Ill. .... M
American Insulated Wire Corp., Div. of General Cable Co., 45 Baker, Providence, R. I. ..... R F .. A T ..
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. ..... R F H A T M
Americore. See American Steel.
Amerite. See American Steel.
Amerize. See American Steel.
Amparak. See American Steel.
Anaconda Wire & Cable Co., Sycamore, Ill. ..... R W .. A .. M

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Anaconda Wire & Cable Co., Maring Wire
Anaconda Wire & Cable Co., Pawtucket, R. I. ..... R F .. ..
Branch, Muskegon, Mich. (Silk, Enamel) .. .. M
Ansonia Electrical Co., Ansonia, Conn.
Silk, Cotton, Enameled .... A .. M
Armoriokt. See American Steel.
Bay State Insulated Wire & Cable Co., Paydras (Mattapan), 26, Boston..... R .. ..
Chicago, Ill. ..... R F H A T M
Belden Mfg. Co., 2310B S. Western Ave.,
Beldenamel. See Belden Mfg. Co.
Beldenite. See Belden Mfg. Co.
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. ..... R F .. ..
Boston Insulated Wire & Cable Co., 65 Bay, Boston, Mass. ..... R F H .. .. ..
Bradford, Kyle & Co., Plymouth, Mass. .. .. M
Cablex. See Collyer Insulated Wire Co.
Celatsite. See Acme Wire Co.
Collyer Insulated Wire Co., Pawtucket, R. I. ..... R F H .. ..
Colorbeston. See General Elec. Co.
Condex. See Simplex Wire Co.
Coleruhber. See Belden Mfg. Co.
Copperweld Steel Co., Rankin, Pa..... R .. .. .. T ..
Cotenamel. See Belden Mfg. Co.
Cottonite. See Acme Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J. ..... R F H A T M
Darow Mfg. Co., 36 E. 20th, New York. R .. ..
Davis-Jones Insulated Wire Co., Pawtucket, R. I. ..... R F H A T ..
Deltabeston. See York Insulated.
Detroit Insulated Wire Co., Detroit, Mich. R .. .. .. T ..
Diamond Braiding Mills, Chicago Heights R F H .. .. M
Di-Noburn. See Diamond Braiding Mill.
Dreadnaught. See Indiana Rubber Co.
Driver-Harris Co., Harrison, N. J..... R .. H .. .. ..
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind.. .. .. M
Ducutto. See Dudlo Mfg. Co.
Durabilt. See Anaconda Wire & Cable Co.
Duracord. See Anaconda Wire & Cable Co.
Durawire. See Anaconda Wire & Cable Co.
Duro. See McEvoy, C. H.
Eagle. See Goldmark Co., James.
Eastern Insulated Wire Co., Tilton, N. H. R .. ..
1885. See Chicago Insulated Wire.
Enamelite. See Acme Wire Co.
Fibrex. See Simplex Wire Co.
Flexible Woven Cable Co., 755 Boylston, Boston, Mass. .... F .. ..
Flex-O-Cord. See Packard Elec. Co.
Garco. See General Asbestos Co.
Gavitt Mfg. Co., West Brookfield, Mass. .. .. T ..
GE-Flex. See General Elec. Co.
General Asbestos & Rubber Co., Charleston, S. C. .... H .. .. ..
General Elec. Co., Merchandise Dept., Bridgeport, Conn.... R F H .. .. M
Giant. See Collyer Insulated Wire.
Goldmark Co., James, 83 Warren, New York, Annunciator and Asbestos, Cotton, Silk and Enameled Magnet .... A .. M
Goodyear Rubber Insulating. See Graybar Electric Co.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y. R .. .. .. T ..
Grimshaw. See New York Ins.
Halex. See Hatfield Rubber Wks.
Hatfield Rubber Wks., Inc., Hillside, N. J. ..... R F H .. T ..
Hazacord. See Hazard Insulated Wire Works.
Hazard Insulated Wire Works, Div. of Okonite Co., Wilkes-Barre, Pa.... R F .. A .. ..
Holyoke Co., 621 Broadway, New York.. R .. .. A .. M
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. ..... R F H .. ..
I. X. L. See Collyer Insulated.
Kable. See Safety Cable Co.
Kenrite. See American Insulated.
Kerite Ins. Wire Cable Co., 30 Church, New York, N. Y. ..... R .. ..
Kilo. Co., 2 E. 23d, New York..... .. .. .. T M
Koelle, Frederick C., Real Estate Trust Bldg., Philadelphia, Pa. .... T ..
Lowell Insulated Wire Co., Lowell, Mass. R F H .. .. ..
Liberty. See Nat. Metal Molding.
Loxsteel. See Hazard Insulated Wire Works.
McEvoy, C. H., Lowell, Mass. ..... R .. .. .. T ..
Marion Insulated Wire & Rubber Co., Marion, Ind. ..... R F H A T ..
Massachusetts Elec. Mfg. Co., West Lynn, Mass. .... M
Montgomery Co., J. R., Windsor Locks, Conn. .... T ..
National Elec. Products Corp., Pittsburgh, Pa. ..... R F H A T M
N. E. See Goldmark Co., James.
New York Insulated Wire Co., 114 Liberty, New York, N. Y. ..... R .. ..
Nitro. See Belden Mfg. Co.
O. K. See Phillips Wire Co. Also
Okocord. See Okonite Co.
Okonite Co., Passaic, N. J. ..... R .. ..
Ozex. See Simplex Insulated Wire
Packard Electric Co., Warren, O..... R F .. ..
Parac. See Phillips Wire Co.
Paracore. See U. S. Rubber Co.
Paraflex. See Bishop Wire & Cable.
Paranite. See Indiana Rubber.
Parkerite. See Seward Wire Co.
Pasc. See Packard Elec. Co.
Philadelphia Insulated Wire Co., 200 N. Third, Philadelphia, Pa. .... H A T ..

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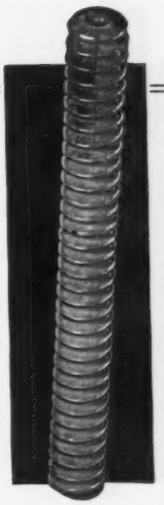

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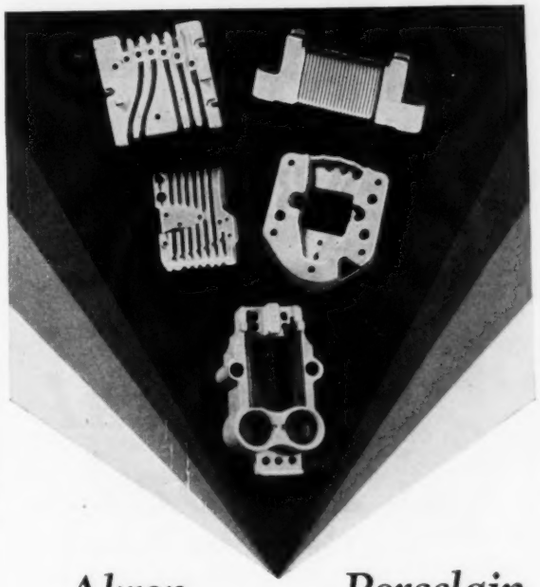

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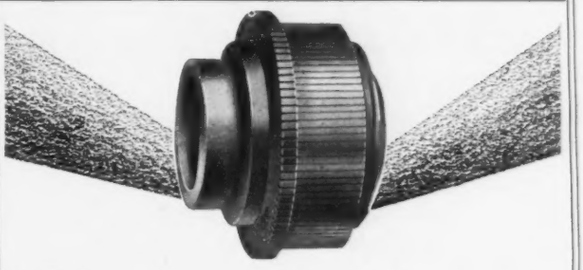

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WIRE, Insulated—Continued

Phillips Wire Co., Pawtucket, R. I..... R . . . . . .
Providence Insulated Wire Co., Providence R F H A . . .
Raven Core. See New York.
Reliance. See American Steel.
Rockbestos Products Corp., Nicoll & Conner Sts., New Haven, Conn..... R . . H . . T M
Roebling's Sons Co., John A., Trenton, N. J. ..... R F H A T M
Rome Electrical Co., Rome, N. Y. .... M
Rome Wire Co., Rome, N. Y..... R F H . . T M
Rosa Wire Co., 69 Bath, Providence, R. I.. R . . . . . .
Runzel-Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill..... . . . . . T . .
Safety Cable Co. (Div. of General Cable Corp.), New York ..... R F H . . . . .
Salamander. See York Insulated.
Seward Wire Co., Parkersburg, W. Va. R . . . . . .
Silkenamel. See Belden Mfg. Co.
Silkenite. See Acme Wire Co.
Simcore. See Simplex Wire.
Simplex Wire & Cable Co., 63 Sydney, Cambridge, Mass. ..... R F . . . . . .
Shield. See Ansonia Elec'l Co.
Southern States Cable Co., Div. of General Cable Corp., Mobile, Ala..... . . . . . M
Spiralweave. See Hazard Ins. Wire
Standard Alloy Wire Co., Elizabeth, N. J. . . . . H . . . . .
Standard Underground Cable Co., Pittsburgh, Pa. (Div. of General Cable.) R F H A T . .
Sterling. See Standard Underground.
Sterling Insulated Wire Co., Fall River, Mass. ..... R . . . . . .
Strand & Sweet Mfg. Co., Winsted, Conn. . . . . M
Super-Service. See Rome Wire Co.
Sweetstrand. See Strand & Sweet.
Tip-Top. See Standard Underground.
Tirex. See Simplex Wire & Cable.
Trenchlay. See Rome Wire Co.
Triangle Conduit Co., Dry Harbor Rd. & Cooper Ave., Brooklyn..... R . . . . . .
Tubular Woven Fabric Co., Pawtucket, R. I. ..... R F . . . . . .
United States Rubber Co., 1790 Broadway, New York, N. Y..... R . . H A T . .
U. S. Royal. See United States.
Varflex Corp., Rome, N. Y. .... M
Warrior. See American Copper.
Wheeler Insulated Wire Co., Bridgeport, Conn. ..... R F H A T M
White, J. M., 1128 Oliver, Philadelphia, Pa. ..... R F H . . T . .
Whitney Blake Co. See Graybar Electric Co.
Wovenite. See Flexible Woven.
York Insulated Wire Wks. of G. E. Co., 120 Broadway, New York, N. Y..... R . . H . . . M

WIRE, Steel Flat

Steel Coating for Armored Conductor.
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill.
Crescent Insulated Wire & Cable Co., 319 N. Oden Ave., Trenton, N. J.
Roebling's Sons Co., John A., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.

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WIRE MANUFACTURING MACHINES

(See Also Wire Drawing Machines; Insulation Mixers; Taping Machines, Wire; Wire Polishing Machines; Enameling Machines for Magnet Wire; Wire Wrapping Machines; Vulcanizers, Wire Insulation.)

Armoring Machines ..... See A
Braiding Machines ..... See B
Bunching Machines ..... See S
Covering Machines ..... See I
Insulating Machines ..... See I
Insulation Straining Machines..... See I
Measuring Machines ..... See M
Park Cabling Machines..... See A
Saturating Tanks ..... See F
Spooling Machines ..... See U
Stranding Machines ..... See S
Tinning Tanks ..... See F
Winding Reels ..... See U

Adamson Machine Co., Akron, Ohio.. I A . . . . . .
Aimco-Seward. See American Insulating Machinery Co.
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa. I A . . . . S U F
Breguet. See American Insulating
Crescent. See Royle & Sons, John.
Durant Mfg. Co., 662 Buffum, Milwaukee, Wis. .... M . . U . .
Housatonic Machine & Tool Co., Bridgeport, Conn. ..... I . . . . . U . .
Minneapolis Elec. & Construction Co., 80 S. 12th St., Minneapolis, Minn. . . . . M . . U . .
Nebuttco. See New England Butt Co.
New England Butt Co., 324 Pearl, Providence, R. I. ..... I A B M S U . .
Peerless. See Royle & Sons, John.
Royle & Sons, John, Paterson, N. J. I . . . . . .
Sleeper & Hartley, Inc., Worcester, Mass. .... A . . . S U
Terkelson Machine Co., 326 A St., Boston, Mass. .... M . . . . .
Textile Machine Works, Reading, Pa. . . . . B . . . . . .
Universal Wire Machy. Co., 69 Daggett, New Haven, Conn..... . . A . . . . U F
Utility Mfg. Co., Cudahy, Wis..... I . . . . . .
Wardwell Braiding Machine Co., Central Falls, R. I..... . . . . B . . . . . .
Wire Machinery Corp. of Am., New Haven, Conn. .... M S U . .
Weir. See Housatonic Machine

WIRE POLISHING MACHINES

(See Also Wire Manufacturing Machines).

American Insulating Machinery Co., 519 Huntington Ave. Philadelphia, Pa.
New England Butt Co., 324 Pearl, Providence, R. I.

WIRE STRAIGHTENING MACHINES

Kane & Roach, Syracuse, N. Y.
Shuster Co., F. B., New Haven, Conn.

WIRE TAPING MACHINES. See Taping Machines, Wire

WIRE VULCANIZING MACHINES. See Vulcanizers Wire Insulation.

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WIRE WRAPPING MACHINES

Terkelson Machine Co., 326 A St., Boston, Mass.

WOOD BLOCKS. See Cabinets & Boxes, Wood.

Boxes. See Cabinets & Boxes, Wood
Cabinets. See Cabinets & Boxes, Wood
Pulleys. See Pulleys, Composition.
Woods Metal. See Radio Mountings.

WRAPPERS, Paper. See Boxes and Wrappers.
WRAPPERS, Tungsten Lamp. See Boxes and Wrappers.
WRAPPING MACHINES, WIRE. See Wire Wrapping Machines.

YARN AND THREAD; Silk, Cotton, Asbestos

American Asbestos Co., Norristown, Pa.
American Glanzstopf Corp., 180 Madison Ave., New York, N. Y.
Anchor Thread Co., Trenton, N. J.
Asbestos Fibre Spinning Co., North Wales, Pa.
Columbian Rope Co., Auburn, N. Y.
Commercial Rayon & Thread Co., 19 W. 21st, New York, N. Y.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
Florsheim, H. A., 225 Fifth Ave., New York, N. Y.
Franklin Rayon Corp., 86 Crary, Providence, R. I.
General Electric Co., Schenectady, N. Y.
Great Lakes Yarn & Thread Co., 5133 Wesson Ave., Detroit, Mich.
Johns-Manville Corp., New York, N. Y. (Asbestos.)
Keasbey & Mattison, Ambler, Pa.
Lees Mfg. Co., 320 Broadway, New York, N. Y.
Multiple Winding Co., 77 Summer, Boston, Mass.
Rich & Co., H. S., 180 S. Water, Providence, R. I.
Ryle & Co., Wm., 381 Fourth Ave., New York, N. Y.
Silkslip. See Worcester Bleach & Dye Wks. Co.
Smith & Dove Mfg. Co., Andover, Mass. (Linen Thread.)
Worcester Bleach & Dye Wks., Worcester, Mass.

ZINC

Horse Head. See New Jersey Zinc Sales Co.
New Jersey Zinc Sales Co., 160 Front, New York, N. Y.
Platt Bros. & Co., Waterbury, Conn. (Strips.)

ZINCS AND COPPERS, Battery

Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Edes Mfg. Co., Plymouth, Mass.
Extruded Metal Corp., 184 53rd, Brooklyn, N.Y. (Zinc Cups.)
Franklin. See Grasselli Chemical Co.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Illinois Zinc Co., Peru, Ill.
Lind Mfg. Co., 70 Wyckoff Ave., Brooklyn, N.Y. (Zinc Cups.)
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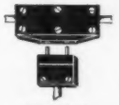
CONNECTORS
for ELECTRICAL DEVICES

No. 950

No. 8950-B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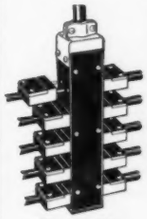
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CONNECTOR BULLETIN
No. 102

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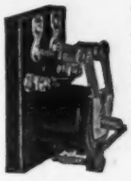

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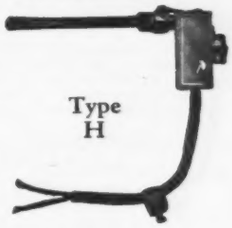
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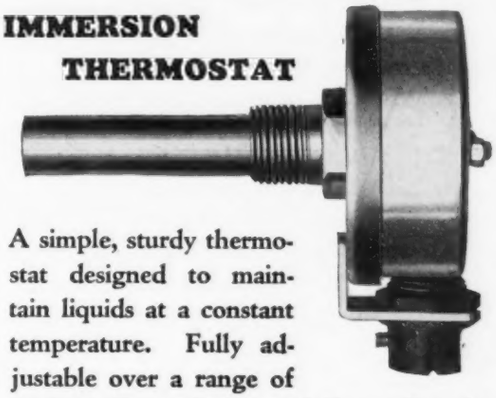

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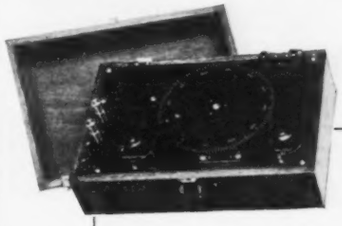

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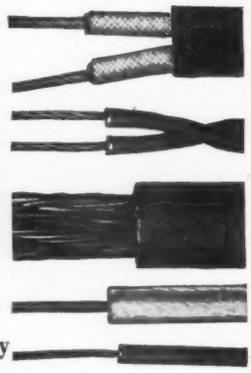
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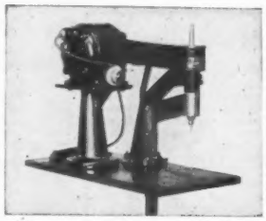
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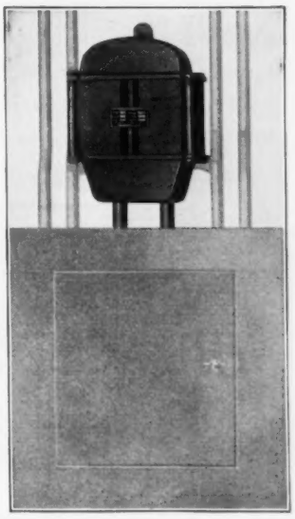

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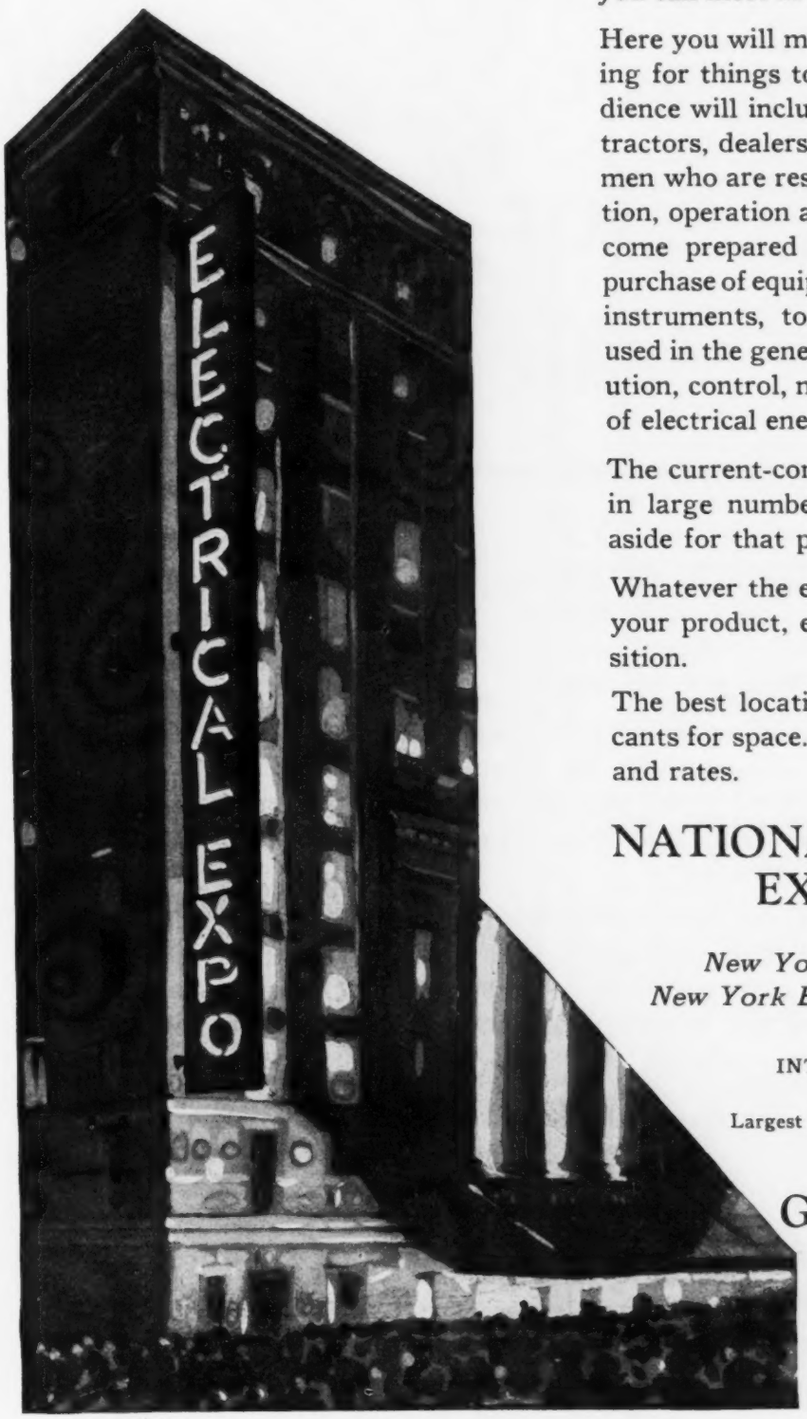

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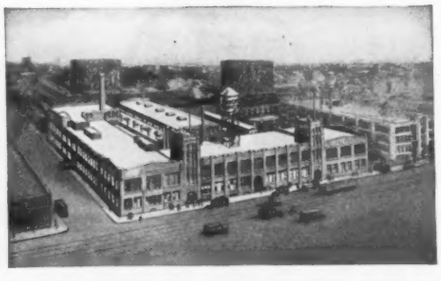

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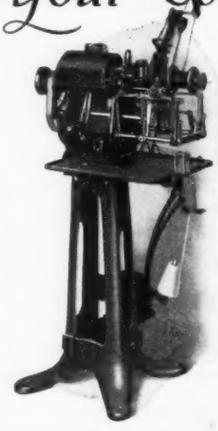

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connectors....

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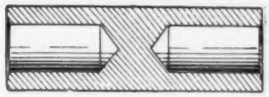
—with dividing wall.

These connectors, for safety and economy, should be standard equipment on all motor-driven machinery; they will help sell your products.



For Solid and Stranded Cable

—wire holes clear through.

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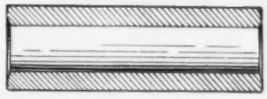

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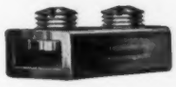

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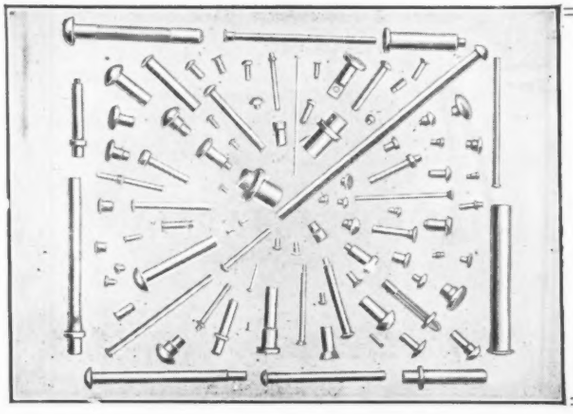

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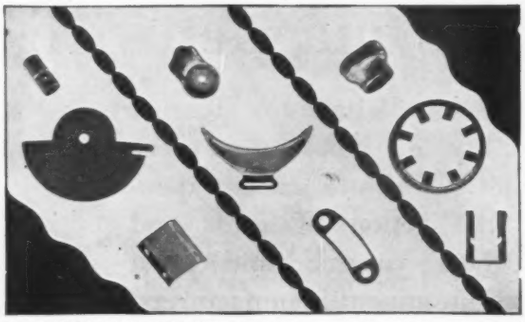

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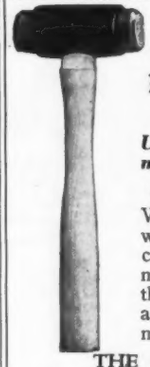

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Saves Battered-Up Motor Parts

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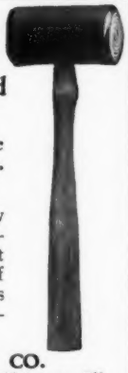

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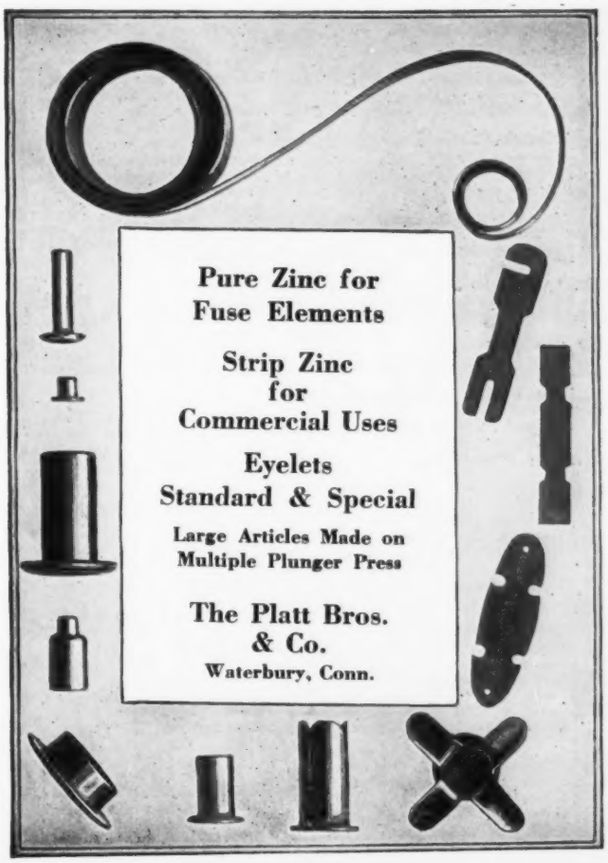

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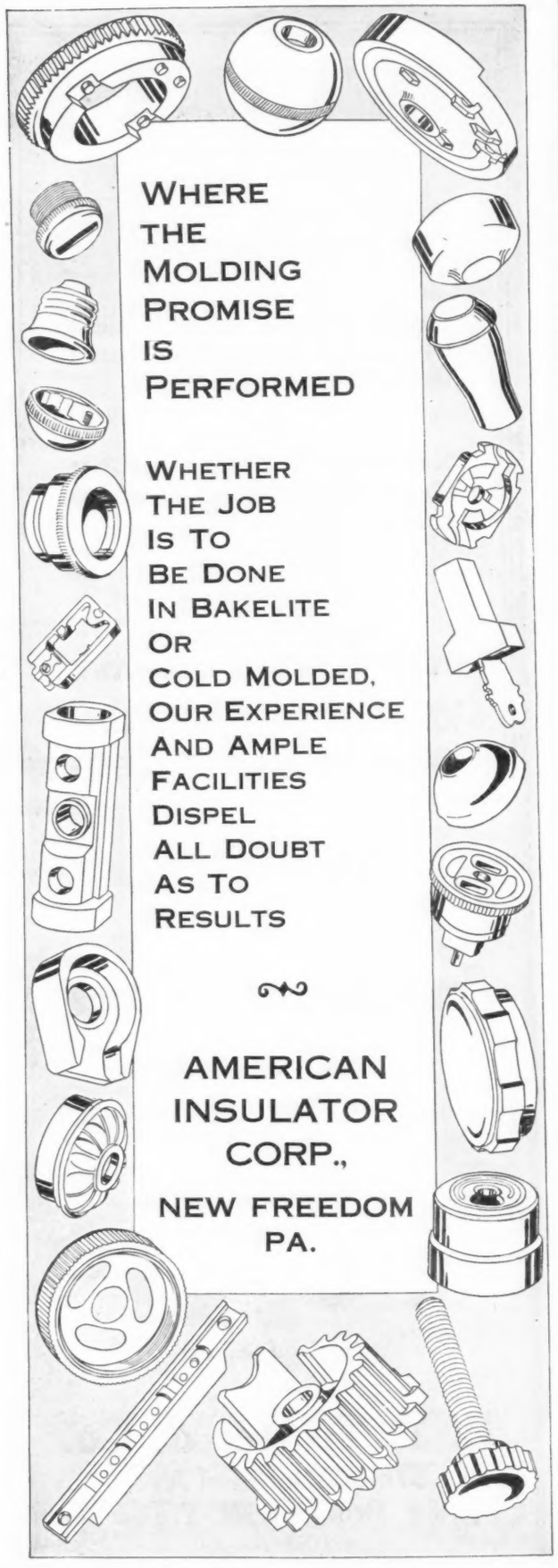

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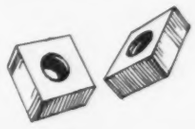
No nuts to loosen when fastenings to sheet metal are made with these Self-tapping Screws



SHEET metal assemblies made with Hardened Self-tapping Sheet Metal Screws are secure assemblies. No nuts to loosen or come off.

And less time and effort is required to make fastenings with these unique Screws. No need to fumble with nuts and washers . . . no troublesome tapping—no tapping plates. Just turn the Self-tapping Screw into a drilled or punched hole with an ordinary screw driver. It takes but a fraction of the time and considerably less effort than other methods.

As the Self-tapping Screw is turned in, it cuts its own thread in the metal, binding the members firmly together.

With these Screws you can save time and speed up assemblies of thin sheet metal or metal as heavy as 10 gauge (0.140″). They are also equally well suited for use in solid material of comparatively soft composition, such as aluminum and die castings, Bakelite, Ebony, asbestos, transite board, slate, etc.

Most prominent electrical manufacturers are using these Screws to advantage. Try them yourself—we will send sufficient samples for a trial. Just describe your assembly.

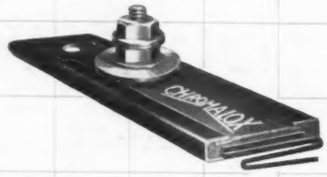
PARKER-KALON CORP., 190-204 Varick St., NEW YORK, N.Y.

Distributed in Canada by Aikenhead Hardware Ltd., 19-21 Temperance St., Toronto

PARKER-KALON
HARDENED SELF-TAPPING
Sheet Metal Screws

PATENTED
APR. 1, 1919 - No. 1299232 — MAR 28, 1922 - No. 1411184
AUG. 14, 1923 - No. 1465148 — FEB. 10, 1925 - No. 1526182
OTHERS PENDING

The Industry is turning to the ★*embedded type* HEATING UNIT



as best represented by the Chromalox line of heating units

This chart shows the trend of leading appliance and industrial equipment manufacturers towards adopting Chromalox embedded type heating units. Today, more than 90 electrical manufacturers are making their products trouble-free by standardizing on patented Chromalox heating units.

★having the resistor wire embedded in refractory.

REASONS: Because, as manufacturers and dealers and central station commercial managers will tell you, Chromalox heating units have definitely helped to eliminate heating unit problems. Of patented construction (having the resistor wire embedded in refractory) these Chromalox units have enabled many an appliance manufacturer to finally put on the market products that are trouble-free as far as the heating element is concerned.

Chromalox-equipped, A Vital Selling Point

"Chromalox - equipped" — that in itself is a definite guarantee that such appliances will give your customers the best of performance service. That's why manufacturers such as Majestic Elec. Appliance Co., Wells Mfg. Co., Armstrong Elec. & Mfg. Corp., American Ironing Machine Co., play up the fact that they use Chromalox units. It's a convincing selling point. It means that you and your dealers won't be bothered with the usual kicks and comebacks that put you in wrong with customers, and eat into your profits.

Chromalox-equipped Products STAY SOLD

Most of the guess work about your product doing a real job can be easily eliminated by using Chromalox units. Automatically, kicks and come-backs are side-tracked when you use these trouble-free units.

But What About Your Products?

Whether you are working on a new product or improving an old one, we can be of valuable help to you with experience gained from years of working with leading companies making all kinds of electrically heated equipment. When you write for the Chromalox bulletins, tell us about the appliances or heating devices you want properly heated. There's no obligation!

Write for your copy of these 8-page bulletins showing dozens of sizes and ratings of the largest complete line of heating units for all kinds of electrical appliances, heating devices, hotel and restaurant equipment and other electrically heated products.

This thoroughly modern day-light factory now nearing completion, will be devoted to the manufacture of Chromalox heating units

★Chromalox ELECTRIC HEATING UNITS

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